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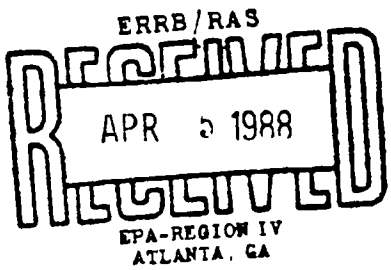
EPA WORK ASSIGNMENT NUMBER 189-4L15
UNDER
CONTRACT NUMBER 68-01-7250



RI/FS WORK PLAN
BLUFF ROAD SITE
RICHLAND COUNTY, SOUTH CAROLINA

MARCH 1988

NOTICE

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RI/FS WORK PLAN
BLUFF ROAD SITE
RICHLAND COUNTY, SOUTH CAROLINA

MARCH 1988

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1.0 INTRODUCTION

This Work Plan was prepared by Ebasco Services Incorporated (Ebasco) for the U.S. Environmental Protection Agency (EPA) Region IV, under the REM III Program (Contract No. 68-01-7250, Work Assignment No. 189-4L15). Together with the accompanying Field Operations Plan (FOP), which consists of the Field Sampling and Analysis Plan (FSAP) and the Health and Safety Plan (HASP), it describes Ebasco's approach to completing the Remedial Investigation/Feasibility Study (RI/FS) for the Bluff Road Site.

The potentially responsible parties (PRPs) for the Bluff Road site RI/FS will be conducting the work. This Work Plan and the FOP have undergone revisions, at the direction of the EPA, so that the work may be conducted by the PRPs, outside of the REM III program requirements.

Guidance for developing this RI/FS Work Plan was provided by the following:

- Guidance on Remedial Investigations under CERCLA (June 1985);
- Guidance on Feasibility Studies under CERCLA (June 1985);
- The National Oil and Hazardous Substances Contingency Plan (NCP), 40 CFR 300;
- The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), Public Law 96-510, as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA);
- Standard Operating Procedures and Quality Assurance Manual, Engineering Support Branch, U.S. EPA, Region IV, April 1986;
- REM III Program Guidelines;
- Superfund Public Health Evaluation Manual (Draft), December 1985; and
- Superfund Exposure Assessment Manual (Draft), January 1986.

A Remedial Investigation (RI) of the Bluff Road site was initiated in 1984 by Golder Associates (Golder) under the direction of the South Carolina Department of Health and Environmental Control (SCDHEC). Versar, Inc., (Versar) reviewed Golder's Draft RI Report for the EPA under the TES III program (Work Assignment No. 353 of EPA Contract No. 68-01-731). As a result of this review, Versar identified data gaps in the Golder RI, developed recommendations to fill those gaps, and prepared written plans for completing the Bluff Road RI/FS. Versar's project plans, as reviewed and approved by the EPA, consist of:

- Final Remedial Investigation/Feasibility Study Completion Work Plan (submitted July 8, 1987);
- Final Sampling Plan (submitted August 18, 1987);
- Final Data Management Plan (submitted August 18, 1987); and
- Final Health and Safety Plan (submitted September 8, 1987).

On September 25, 1987, following acceptance of the four Versar plans, the EPA issued Work Assignment No. 189-4L15 to Ebasco to conduct the RI/FS under the REM III program. The first requirement of this assignment was the preparation of this detailed project Work Plan.

Ebasco's project planning for the Bluff Road RI/FS is based on the previous project scoping/planning activities conducted by Versar.

This Work Plan includes all of the essential elements of the RI/FS program recommended in the Versar Work Plan but has been reorganized and expanded to conform to the latest requirements of EPA guidelines for preparing RI/FS Work Plans and conducting RI/FS projects. Specific elements that have been added to this Work Plan that were not explicitly addressed in Versar's Work Plan include:

- A preliminary identification of Applicable or Relevant and Appropriate Requirements (ARARs);
- Development of preliminary remedial response objectives;
- Preliminary identification of applicable remedial technologies;

- Definition of Data Quality Objectives (DQOs);
- Consideration of a possible Expedited Response Action for an above ground tank that remains on the site; and
- Community Relations support.

The Versar RI/FS Completion Work Plan and Sampling Plan developed a recommended scope of study for RI field investigations. However, these recommendations lacked specificity regarding the types, numbers and locations of sampling points, the procedures for sample collection, sample analytical protocols, and analytical data quality objectives. These elements have been specified in this Work Plan and the accompanying FOP.

Versar's Data Management Plan specified QA/QC requirements for field and laboratory procedures, for management of data, and for management of project files. Versar's requirements are not consistent with the current EPA-approved requirements and have been replaced in this Work Plan and the accompanying FOP.

In order to avoid unnecessary duplication of effort, Ebasco has attempted to limit discussion of certain subjects in this Work Plan that are typically discussed in detail in RI/FS Work Plans. These limited discussions include:

- Discussions of the site background, environmental setting, history and current status. These subjects have been discussed in detail in other documents relating to the site (specifically, the Golder RI, the Versar project plans identified above, and EPA and SCDHEC file reports).
- Detailed descriptions of the format and content of the final RI/FS reports. Shortcomings of the Golder RI report are explicitly addressed in the Versar Work Plan. Overall report organization and content requirements are included in EPA guidance documents on performance of RI/FSs, selection of remedies, and preparation of Records of Decision.

This RI/FS Work Plan contains six sections, including this Introduction (Section 1.0). Section 2.0 provides background information on the location, general characteristics, history, and current status of the site. Section 3.0 outlines the scoping of the RI/FS. The various tasks which comprise the RI and FS portions of the program are described in Sections 4.0 and 5.0, respectively. Project management aspects, including quality assurance, data management and schedule, are discussed in Section 6.0.

2.0 SITE BACKGROUND

2.1 SITE LOCATION AND GENERAL CHARACTERISTICS

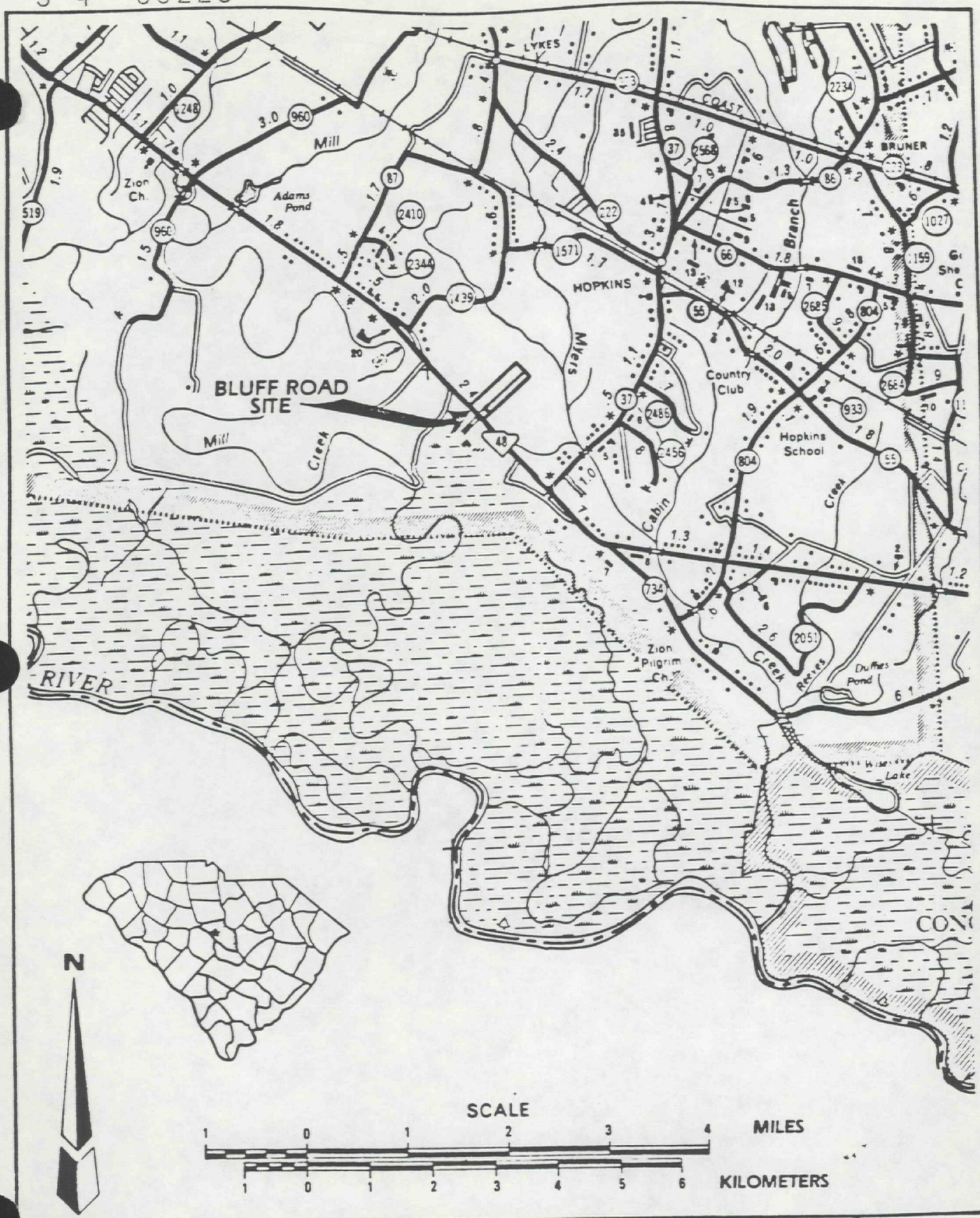
The Bluff Road Site is located in a mostly rural area on State Route 48 (Bluff Road), approximately 10 miles southeast of Columbia, Richland County, South Carolina (Figure 2-1). It is bordered on the southwest by Bluff Road, on the southeast by Campbell's Garage (abandoned), and on the northeast and northwest by wooded land. A large industrial facility (Westinghouse Electric Corporation, Nuclear Fuel Division) is located across Bluff Road from the site. The nearest residences are located along Bluff Road approximately one mile to the northwest and one mile to the southeast of the site.

The site lies on a nearly flat, poorly drained terrace in the valley of the Congaree River, at an elevation of approximately 138 feet above mean sea level (MSL). The river lies approximately 4 miles south of the site. The site is drained by overland flow, by a drainage ditch, and by an unnamed tributary to Myers Creek (see Figure 2-1). Myers Creek enters the Congaree River approximately six miles south of the site. The extent of contamination in the water and sediments of drainage paths has not been determined.

The site is located near the landward boundary of the Upper Coastal Plain physiographic province. In this area, clastic sedimentary deposits of Cretaceous and Tertiary age overlie older crystalline rocks. A surficial sand unit is the uppermost aquifer in the region. The water table in this unit is generally encountered at a depth of about eight to ten feet below the land surface.

A clay unit underlies the surficial sands at a depth of about 50 feet. This clay unit serves as an aquitard, restricting the downward flow of groundwater from the surficial aquifer, and serving as a confining layer on the underlying sand aquifer. This lower confined aquifer is an important source of water supplies in the region. It has not been determined whether this lower aquifer has been contaminated.

Additional information on the site environmental characteristics is provided in the FOP and the Golder RI report.



REM III
LOCATION MAP
BLUFF ROAD SITE
COLUMBIA, SOUTH CAROLINA

EBASCO

FIGURE
2-1

2.2 SITE HISTORY

The Bluff Road Site was operated by South Carolina Recycling and Disposal, Inc. (SCRDI) as a storage, recycling, and disposal facility for waste chemicals from 1976 to 1982. An acetylene manufacturing facility was located on the property prior to its use as a waste management facility.

In March 1980, a site inspection was conducted by the U.S. EPA. The inspection revealed containers of chemicals leaking into drainage ditches and into an onsite surface lagoon (previously used by the acetylene manufacturer). Analysis of the drainage ditch sediments revealed the presence of organics, pesticides, and metals.

The South Carolina Department of Health and Environmental Control (SCDHEC) conducted groundwater investigations at the site in 1980 and 1981. The groundwater investigations documented an increase in levels of organic contaminants at the site during that span of time.

In 1982 and 1983, a preliminary clean-up of the site was performed by a group of Potentially Responsible Parties (PRPs) under the direction of the SCDHEC and the U.S. EPA. Drums of chemicals and contaminated soil were removed. However, the onsite lagoon, an above ground tank, and possible filled lagoon material next to the onsite lagoon (reported to be lime from the acetylene manufacturing operation) were left on the site.

In November, 1984, a Remedial Investigation (RI) of the Bluff Road Site was initiated by Golder Associates under the direction of the SCDHEC. The RI was conducted in a phased manner. The phases encompassed the following tasks:

1) Background data collection;

2) Collection of soil, lagoon, and sludge samples;

3) Geophysical survey;

4) Installation and sampling of groundwater monitoring wells. This program is referred to in the Golder RI as the Initial Well Program. Also, a soil gas survey was conducted to determine the extent of volatile organic contamination; and

5) Installation and sampling of groundwater monitoring wells. This program is referred to in the RI as the Second Well Program. A pump test was also conducted as part of this program to determine the hydraulic conductivity of the uppermost aquifer. Water collected during the pump test was aerated in an attempt to remove volatile organics from the contaminated ground water. This activity was completed in January 1986.

Golder Associates submitted the current draft of the RI report to the SCDHEC and the EPA in April 1986. At that time, no work had been performed on the FS portion of the RI/FS. Upon preliminary examination of the RI report, the EPA found that data gaps might exist in the Golder RI and that additional site characterization work might be required.

EPA then issued a work assignment, under the TES III program, for a comprehensive review of the Golder RI and preparation of plans for filling identified data gaps and completion of the RI/FS. This work was initiated by Versar, Inc. Versar submitted final Work Plans, Sampling Plans, Health and Safety Plans, and Data Management Plans during the third quarter of calendar year 1987.

2.3 CURRENT SITE STATUS

Hazardous substances, principally volatile organic compounds and metals, remain on the site in contaminated soils and in the groundwater. In addition, as reported in the Golder RI, one above ground tank contains sludge that is highly contaminated with 2-chlorophenol and phenol. A generalized map of the site is shown in Figure 2-2. Additional information on the contaminants present at the site is presented in Section 3.1.

The extent and magnitude of contamination on and off the site in soils, groundwater, and drainage pathways have not been fully defined. Versar, Inc. has completed a comprehensive review of the Golder RI report, and has identified areas in which data gaps exist, data are questionable, and report deficiencies exist. Versar also has developed general plans for the work required to correct the identified deficiencies.

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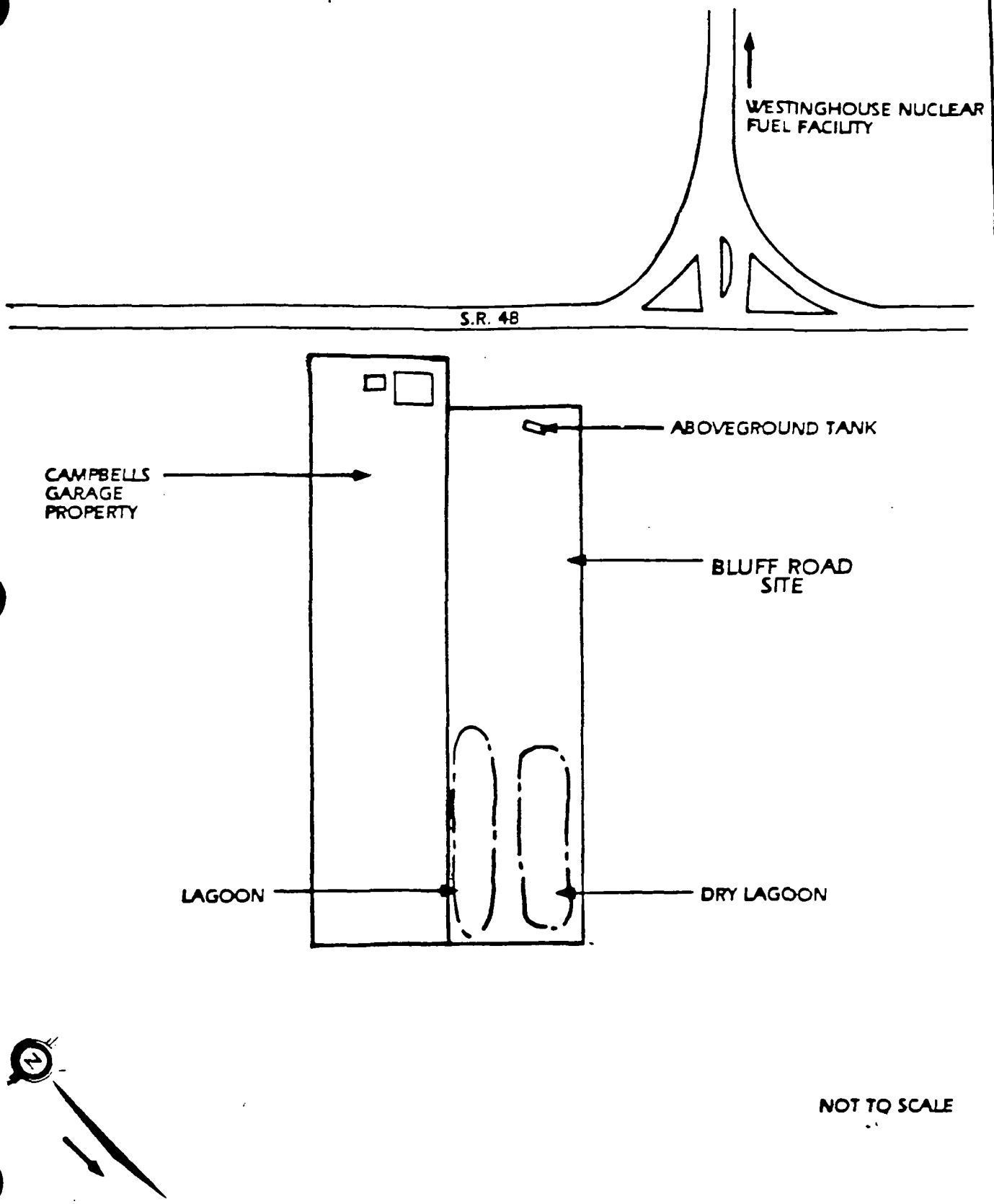


NOT TO SCALE

REM III
GENERAL SITE PLAN
BLUFF ROAD SITE
COLUMBIA, SOUTH CAROLINA

FIGURE
2-2

BECHTEL

The EPA assigned Ebasco the tasks of implementing the RI completion activities and conducting the FS under the REM III program. Ebasco reviewed Versar's plans and prepared this Work Plan and the accompanying Field Operations Plan to define the scope of the RI/FS completion assignment.

Subsequent to the REM III Work Assignment, EPA negotiations with the PRPs led to an agreement. That agreement directs the PRPs to perform the required work.

3.0 SCOPING OF THE REMEDIAL INVESTIGATION/FEASIBILITY STUDY

Previous investigations have confirmed that contamination remains on the site. However, they did not adequately define the extent or magnitude of that contamination. Versar, Inc. completed a comprehensive review of the previous investigations for the EPA, and developed a scope of work for completion of the Bluff Road site RI/FS. Versar's recommended scope was reviewed and approved by the EPA and is presented in the document titled "Final Remedial Investigation/Feasibility Study Completion Work Plan" (Versar, Inc., July 8, 1987). Ebasco conducted a detailed review of the Versar RI/FS Completion Work Plan and developed a detailed approach to implementing its recommendations. That approach is presented in this document and the accompanying FOP.

Ebasco's approach incorporates the essential work elements recommended by Versar, and portions of this document have been extracted directly from the Versar RI/FS Completion Work Plan (with minor editorial revision). Additional investigative activities on the existing above ground tank at the site (see Section 3.2.4) are also included in this plan.

In addition, minor elements of Versar's recommended field investigations have been modified in order to achieve greater cost-effectiveness. Others were eliminated because they were not essential to the identification and evaluation of remedial alternatives.

In order to ensure that the scope of work would fulfill the data requirements of the project, Ebasco identified Applicable or Relevant and Appropriate Requirements (ARAR's), remedial response objectives, potential response actions and associated technologies, and the data required to evaluate the remedial technologies. Specific objectives for the RI/FS project completion and data quality objectives were then defined. The results of these efforts are discussed in the following subsections. Ebasco also conducted a preliminary risk assessment. However, this assessment has been excluded from the Work Plan at the direction of the EPA.

3.1 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

One of the primary concerns in the development of remedial action alternatives for sites governed by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is the degree of public health or environmental protection afforded by each remedy. EPA policy states that in the process of developing and selecting remedial action alternatives, primary consideration should be given to actions that attain or exceed Applicable or Relevant and Appropriate Requirements (ARARs), as defined by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) and the Superfund Amendments and Reauthorization Act (SARA). The purpose of this requirement is to make CERCLA response actions consistent with other pertinent Federal and state environmental requirements.

SARA defines an ARAR as:

- Any standard, requirement, criterion, or limitation under Federal environmental law.

- Any promulgated standard, requirement, criterion, or limitation under a state environmental or facility siting law that is more stringent than the associated Federal standard, requirement, criterion, or limitation.

Applicable requirements are Federal public health and environmental requirements that would be legally applicable to a remedial action if that action was not undertaken pursuant to CERCLA. For example, if hazardous waste activities were undertaken pursuant to an approved permit, applicable regulations would be available to legally define the required remedial action for site closure. Relevant and appropriate requirements are Federal public health and environmental requirements that apply to circumstances sufficiently similar to those encountered at CERCLA sites, where their application would be appropriate although not legally required. In addition, SARA now requires that state ARARs be considered during the assembly of remedial alternatives if they are more stringent than Federal requirements. EPA has also indicated that "other" criteria, advisories, and guidelines must be considered in devising remedial alternatives.

A listing of the preliminary Federal ARARs identified for the Bluff Road site is provided in Table 3-1. State of South Carolina ARARs have not formally been identified by SCDHEC for the Bluff Road site. However, several types of state regulations may become ARARs depending on whether specific state standards are more stringent than corresponding federal requirements. These are summarized in Table 3-2.

The ARARs will be considered at six decision points during the RI/FS. These include :

1. Task 1 - Work Plan Development: Chemical and location specific ARARs are considered to ensure that sampling and analysis are appropriately planned.

2. Task 6 - Public Health Evaluation: Consider ARARs during the analysis of the risks to public health and the environment.

3. Task 9 - Development of Remedial Objectives: Compare site data base to all ARARs.

4. Task 9 - Identification of Applicable Technologies and Assembly of Alternatives: Utilize ARARs specific to site conditions for development of action levels, specific response objectives, and remedial alternatives relative to criteria defined in 40 CFR 300.68(f). Also, identify ARARs that apply to the formulated alternatives.

5. Task 9 - Screening of Remedial Technologies/ Alternatives: Consider ARARs when assessing the effectiveness of an alternative, as defined in 40 CFR 300.68(g)(3).

6. Task 10 - Remedial Alternatives Evaluation: Evaluate each alternative to the extent it attains or exceeds ARARs, as defined in 40 CFR 300.68(h)(2)(iv).

3.2 SCOPING OF REMEDIAL TECHNOLOGIES

Preliminary remedial response objectives were identified during development of this Work Plan. Potential remedial actions and associated technologies were identified. The scope of the RI was then reviewed to ensure that adequate data are collected to

TABLE 3-1

FEDERAL APPLICABLE OR RELEVANT AND
APPROPRIATE REQUIREMENTS
BLUFF ROAD SITE

	Requirement	Rationale
1.	Hazardous Waste Requirements (RCRA Subtitle C, 40 CFR, Part 264)	Standards applicable to treatment, storage and disposal of hazardous waste.
2.	Safe Drinking Water Act	
	a. Maximum Contaminant Levels (MCLs)	Remedial actions may be required to provide cleanup to the MCLs.
	b. Maximum Contaminant Level Goals (MCLGs)	SARA Section 121(d)(2)(A)(ii)
	c. Underground Injection Control Regulations (40 CFR, Parts 144, 145, 146, and 147)	May be applicable to onsite groundwater recirculation systems.
3.	Toxic Substances Control Act (15 U.S.C. 2601)	
	a. PCB Requirements (40 CFR 761)	PCBs are possible site contaminants.
	b. TSCA health data, chemical advisories, and Compliance Program policy	Considered in the public health evaluation.
4.	Health Advisories, EPA Office of Drinking Water	sampling activities may reveal presence of chemical for which health advisories are listed.

TABLE 3-1 (CONTINUED)

FEDERAL APPLICABLE OR RELEVANT AND
APPROPRIATE REQUIREMENTS
BLUFF ROAD SITE

	Requirement	Rationale
5.	Clean Water Act (PL92-500)	
	a. State water quality standards	See Table 3-2
	b. Federal water quality criteria (FWQC)	Remedial actions may provide groundwater remediation and discharge to surface waters.
	c. NPDES permit	Remedial alternatives may include discharge to surface waters.
6.	Clean Air Act (42 U.S.C. 7401)	
	a. National Ambient Air Quality Standards (NAAQS) for six criteria pollutants (40 CFR Part 50)	Remedial alternatives may include incineration or soil/groundwater water volatilization technologies.
	b. Public health basis to list pollutants as hazardous under Section 112 of the Clean Air Act	Remedial alternatives may include incineration or soil/groundwater volatilization technologies.
7.	OSHA Requirements (29 CFR, Parts 1910, 1926, and 1904)	Required for workers engaged in onsite remedial activities.
8.	Executive Order 11988 (Floodplain Management)	Floodplain resources may be affected by the site remedial alternatives.

TABLE 3-1 (CONTINUED)

FEDERAL APPLICABLE OR RELEVANT AND
APPROPRIATE REQUIREMENTS
BLUFF ROAD SITE

	Requirement	Rationale
9.	DOT Rules for Hazardous Materials Transport (49 CFR, Parts 107, 171.1-171.500)	Remedial alternatives may include offsite treatment and disposal.
10.	Endangered Species Act of 1978 (16 U.S.C. 1531)	Considered in the public health and environmental assessment.
11.	Fish and Wildlife Coordination Act (16 U.S.C. 661)	Remedial alternatives may affect protected habitats.
12.	Fish & Wildlife Improvement Act of 1978 (16 U.S.C. 742)	Remedial alternatives may affect protected habitats.
13.	Fish & Wildlife Conservation Act of 1980 (16 U.S.C. 2901)	Remedial alternatives may affected protected habitats.
14.	Pesticide Registration, Tolerances and Action Levels	Pesticide contaminants present at the site.
15.	Health Effects Assessments	Considered in the public health risk assessment.
16.	EPA's Groundwater Protection Strategy	Remedial alternatives must consider EPA classification of groundwater conditions at site.

Source: 50 Federal Register 224, Wednesday, November 20, 1985.

TABLE 3-2

STATE AND LOCAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
BLUFF ROAD SITE

	Requirement	Rationale
1.	Water Quality Standards	Remedial action may be required to provide cleanup to meet these standards.
2.	Air Quality Regulations	Remedial alternatives may include incineration or soil/groundwater volatilization technologies.
3.	Monitoring/Production	Monitoring well designs may require SCDHEC approval; remedial alternatives may include groundwater withdrawal and treatment.
4.	Sediment Control/Storm Water Discharges	Remedial action may be required to provide cleanup to meet standards.
5.	Hazardous Waste	Remedial alternative may include offsite treatment, transportation, and disposal.
6.	Other requirements	Specific to implementation of a remedial action.

evaluate these technologies and subsequent assembled remedial alternatives in the FS. The approach for this technology screening and evaluation is presented in Section 5.0 of this Work Plan.

3.2.1 Preliminary Remedial Response Objectives

Additional data for the Bluff Road site are needed to fully define the current threat to public health, welfare, and the environment. However, previous work has been sufficient to identify the following preliminary remedial response objectives;

- Reduce or eliminate public and environmental exposure to contaminants present in soil, tanks, and/or lagoon sediment/sludge;
- Reduce or eliminate public exposure to contaminants present in groundwater;
- Reduce or eliminate human exposure to airborne contaminants; and
- Reduce or eliminate impacts due to the offsite migration of contaminants via groundwater, surface water, and air pathways.

The RI will define the type, extent and magnitude of the contamination which remains on the site; the toxicological characteristics of the contaminants present; the degree to which the contaminants have migrated or may potentially migrate off the site; and the potential for human exposure to harmful substances and the public health risk posed by the site. The preliminary response objectives identified above will be supplemented, refined or, if appropriate, eliminated during this process.

3.2.2 Preliminary Scoping of Remedial Actions

Potential site problems which have been identified during the previous investigations or that may be identified during the planned RI include on site waste materials, contaminated soils, contaminated surface water and sediment, and leachate and contaminated groundwater. General response actions to address these site problems may include removal and on site or off site disposal; in-situ treatment; onsite or offsite treatment; containment; diversion; ground water controls; provision of alternative water supplies; or other of the general remedial

response actions listed in Table 3-3. These general response actions will be reviewed during the FS to identify those actions which are applicable to specific site problems. Potential remedial actions fall into the following categories:

- Source control actions;
- Management of contaminant migration actions; and
- No action.

Source Control Actions - Actions designed to prevent or minimize migration of hazardous substances from the source material. At the Bluff Road site, potential sources are the above ground tank, contaminated on site soils, and the water and sediment/sludge in the lagoon(s).

Management of Migration Actions - Actions designed to manage the migration of hazardous substances that have migrated (or may migrate) from the contaminant source to pose a threat to public health or the environment. At the Bluff Road site, contaminants have migrated offsite via surface runoff, groundwater flow, and possibly through the air. If the final risk assessment shows that migration of contaminants poses a threat, contaminant migration control actions may be required.

No Action - If the final risk assessment shows that the site poses no significant threat to public health or the environment, no further action may be necessary except for possible access restriction or other institutional constraints.

3.2.3 Preliminary Scoping of Remedial Technologies

Typical remedial technologies associated with the general response actions are listed in Table 3-4. A more extensive list of technologies is included in Appendix A. Specific technologies or groups of technologies to accomplish the general response actions will be developed during the FS. This will be based on an evaluation of their applicability and effectiveness in addressing the specific problems identified at the Bluff Road site. Site characteristics or waste characteristics that might alter the effectiveness of a remedial technology at the Bluff Road Site will be considered in the review of technologies. Table 3-5 lists some site and waste characteristics to be considered.

TABLE 3-3

GENERAL REMEDIAL RESPONSE ACTIONS

Containment
Pumping
Collection
Diversion
Complete Removal
Partial Removal
Onsite Treatment
In-Situ Treatment
Storage
Onsite Disposal
Offsite Disposal
Alternative Drinking Water Supply
Relocation of Receptors
Other Offsite Measures
Other Institutional Controls
No Action

TABLE 3-4

GENERAL RESPONSE ACTIONS AND ASSOCIATED REMEDIAL TECHNOLOGIES

General Response Action	Technologies
No action	Some monitoring and analyses may be performed.
Containment	Capping; groundwater containment barrier walls; bulkheads; gas barriers.
Pumping	Groundwater pumping; liquid removal; dredging.
Collection	Sedimentation basins; French drains; gas vents; gas collection systems.
Diversion	Grading; dikes and berms; stream diversion ditches; trenches; terraces and benches; chutes and downpipes; levees; seepage basins.
Complete Removal	Tanks; soils; sediments; liquid wastes; contaminated structures; sewers and water pipes.
Partial Removal	Tanks; soils; sediments; liquid wastes.
Onsite Treatment	Incineration; solidification; land treatment; biological, chemical, physical treatment, and thermal stripping.
Offsite Treatment	Incineration; biological, chemical, and physical treatment.

TABLE 3-4 (Continued)

GENERAL RESPONSE ACTIONS AND ASSOCIATED REMEDIAL TECHNOLOGIES

General Response Action	Technologies
In-situ Treatment	Permeable treatment beds; bioreclamation; soil flushing; neutralization; land farming, solidification; and volatilization/vacuum extraction.
Storage	Temporary storage structures.
Onsite Disposal	Landfills; land application.
Offsite Disposal	Landfills; surface impoundments; land application.
Alternate Water Supply	Cisterns; aboveground tanks; deeper or upgradient wells; municipal water system; relocation of intake structure; individual treatment devices.

TABLE 3-5

SITE CHARACTERISTICS THAT MAY AFFECT REMEDIAL TECHNOLOGY SELECTION

Site volume	Depth to bedrock
Site area	Depth to aquicludes
Site configuration	Degree of contamination
Disposal methods	Direction and rate of groundwater flow
Climate (precipitation, temperature, evaporation)	Receptors
Soil texture and permeability	Drinking water wells
Soil moisture	Surface waters
Slope	Ecological areas
Drainage	Existing land use
Vegetation	Depths of groundwater or plume

WASTE CHARACTERISTICS THAT MAY AFFECT REMEDIAL TECHNOLOGY SELECTION

Quantity/concentration	Infectiousness
Chemical composition	Solubility
Acute toxicity	Volatility
Persistence	Density
Biodegradability	Partition coefficient
Radioactivity	Compatibility with other chemicals
Ignitability	Treatability
Reactivity/corrosivity	

The technologies which are judged to be feasible will then be combined into remedial action alternatives. Each alternative will be composed of one or more technologies capable of addressing the entire range of problems at the site. Specific technologies considered for potential remedial action alternatives may include capping, ground water barriers, ground water pumping and treatment, complete or partial removal, soil flushing, soil aeration, air stripping, and runoff controls.

3.2.4 Expedited Response Action

An above ground tank currently remains on the Bluff Road site. The Golder RI report indicated that this tank contains sludge that is highly contaminated with 2-chlorophenol and phenol. Ebasco believes that an Expedited Response Action (ERA) directed toward remediation of this tank may be warranted.

The EPA has directed the PRPs to evaluate the current situation regarding the tank, utilizing information from previous studies. The PRPs are then to provide an Engineering Evaluation and Cost Analysis (EE/CA) describing the type and extent of an ERA that could be implemented. This will be provided within 30 days of approval of the Final Work Plan.

The need for any additional sampling of the tank will be discussed in the EE/CA. If the EPA does not elect to conduct an expedited tank response action, the tank will be addressed during the Feasibility Study as described in Section 5.0 of this Work Plan.

3.2.5 Data Required to Evaluate the Remedial Technologies

After reviewing remedial technologies, data required to evaluate these technologies were identified. Limited data were obtained in the Golder RI. The Ebasco RI will update these data and collect additional information not previously obtained. Specific data requirements include:

- Characterization of the contaminants in order to assess the human health and environmental risks associated with the site, and to determine the applicability and effectiveness of potential remedial technologies.

- Characterization of the hydrogeology, the degree of ground water contamination, and water use patterns at the site, to evaluate the potential for off site migration of contaminants via ground water, the risk posed to drinking water supplies, and the feasibility of ground water remediation (containment, pumping and treatment) strategies.

- Characterization of the site soils and their degree of contamination, both vertically and horizontally, to assess the human health and environmental risks associated with the site, and the feasibility of soil remediation strategies.

- Characterization of site runoff and drainage, and the hydrology and ecology of area streams, to determine whether the surface water pathway poses a significant risk to human health or the environment, and, if it does, to evaluate the feasibility of surface water remediation strategies.

3.3 RI/FS OBJECTIVES

The objectives of the field, laboratory, and study efforts are to collect data sufficient to analyze the risks to human health and the environment, to determine the applicability and effectiveness of remedial technologies, and to evaluate the feasibility of remedial alternatives. Specific contaminant sources of concern include the existing tank, onsite contaminated soils, and, possibly, the existing onsite lagoon(s). Specific contaminant migration pathways of concern are the shallow and deep ground water systems, and the surface water drainage system. The specific receptors of concern are casual visitors to contaminated onsite areas, consumers of local ground water, users of local surface water bodies, and the local terrestrial and aquatic flora and fauna. The specific objectives and purposes for each of the distinct elements of the RI field investigation are presented in Section 4.3

3.4 DATA QUALITY OBJECTIVES

Data Quality Objectives (DQOs) are established to ensure that the data collected are sufficient and of adequate quality for their intended uses. Five data quality levels are typically recognized, Levels I through V, as follows:

- Level I data can be collected using portable instruments and are typically used for gross engineering determinations or for health and safety screening.

- Level II data are the result of field analyses using portable instruments or mobile laboratories that are not generally subject to strict QA/QC procedures. These data can be used to determine the presence or absence of specific pollutants or for screening to determine sampling locations.

- Level III data are generated by non-CLP laboratories using standard EPA analytical methods. Level III data can be used for timely receipt of analytical results and can be confirmed with Level IV data.

- Level IV data are generated by laboratories using CLP analytical protocol. Level IV data have extensive reporting requirements and are generally necessary in situations where legally defensible data are needed.

- Level V data are generated by special analytical services provided by laboratories that follow CLP (Level IV) QA/QC procedures.

At the Bluff Road site the reporting requirements for legally defensible data are necessary, since there are Potentially Responsible Parties and enforcement action and/or litigation is possible. Data Quality Level IV is intended for most of the sample analyses. Samples requiring fast turnaround (because they will guide subsequent site characterization activities) will be sent for Level III analysis via a local laboratory. The requirements of Level III analysis is provided in Appendix A of the FOP. Ten percent of these samples will be split and sent through the CLP for confirmation analysis at Data Quality Level IV. This will allow for timely reporting of analytical results and provide data verification by duplicate analysis. The data quality levels established for each sampling activity at the Bluff Road site are presented in Table 3-6.

TABLE 3-6

DATA QUALITY OBJECTIVES FOR EACH SAMPLING TASK
BLUFF ROAD SITE

Sampling Activity	Objectives	Data Quality Level
Surface Soils	To locate and characterize areas of surface soil contamination. Results will be used to direct other field activities, in risk assessment, and in evaluating remedial alternatives.	III
Surface Soils	To confirm results of quick turnaround sampling; provide enforcement quality data on surface soil contamination.	IV
Groundwater (Existing Wells)	Follow-up of previous sampling to reassess contamination. Results will be used to locate temporary wells.	III
Surface Water	To determine if Myers Creek and its tributaries are impacted by contaminants from the site. Data will be used in risk assessment and in evaluation of remedial alternatives.	IV

TABLE 3-6 (Continued)

DATA QUALITY OBJECTIVES FOR EACH SAMPLING TASK
BLUFF ROAD SITE

Sampling Activity	Objectives	Data Quality Level
Stream Sediments	To determine if Myers Creek and its tributaries are impacted by contaminants from the site. Data will be used in risk assessment and in evaluation of remedial alternatives.	IV
Lagoon Surface Water	To determine if the water contained in the onsite lagoon is contaminated. Results will be used in the evaluation of alternatives.	IV
Lagoon Sediments	To determine if the sediment contained in the onsite lagoon is contaminated. Results will be used in the evaluation of alternatives.	IV
Lagoon Perimeter Soils	To determine if the shallow soil strata surrounding the lagoon areas are contaminated. Results will be used in evaluating alternatives.	IV

TABLE 3-6 (Continued)

DATA QUALITY OBJECTIVES FOR EACH SAMPLING TASK
BLUFF ROAD SITE

Sampling Activity	Objectives	Data Quality Level
Groundwater (Temporary Wells)	To trace the groundwater plume and aid in determining locations of new permanent monitoring wells. Rapid turnaround is necessary to facilitate field activities. Data may be used in risk assessment and in evaluation of alternatives.	III
Subsurface Soils (Split Spoon)	To determine the extent of contaminant migration in the subsurface soils. Results will be used in determining locations of new monitoring wells, risk assessment, and evaluation of alternatives.	III
Subsurface Soils (Split Spoon)	To confirm the results of quick turnaround subsurface soil sampling; provide enforcement quality data on subsurface soil contamination.	IV
Groundwater (New Monitoring Wells)	To determine the extent of ground water contamination. Results will be used for hydrogeologic determinations, risk assessment and evaluation of alternatives.	IV

TABLE 3-6 (Continued)

DATA QUALITY OBJECTIVES FOR EACH SAMPLING TASK
BLUFF ROAD SITE

Sampling Activity	Objectives	Data Quality Level
Runoff (Sediment)	To characterize the migration of contaminants off the site via runoff. Results will be used in risk assessment.	IV
Subsurface Soils (Geotechnical)	To characterize the physical properties of the soils. Results will be used in the evaluation of alternatives.	II
Subsurface Soils (Shelby Tube)	To characterize the undisturbed physical properties of the Black Mingo Clay. Results will be used in hydrogeologic evaluations and feasibility studies.	II

4.0 COMPLETION OF THE REMEDIAL INVESTIGATION

This section describes the work that will be conducted to complete the RI for the Bluff Road site. Section 5.0 provides a detailed description of the FS tasks.

The RI activities to be conducted correspond to work elements that were initially described in the Versar Work Plan. However, the Versar tasks and subtasks have been reorganized to conform to the eight standard RI tasks, promulgated in the latest EPA guidance, as defined below:

- Task 1 - Project Planning
- Task 2 - Community Relations
- Task 3 - Field Investigation
- Task 4 - Sample Analysis and Data Validation
- Task 5 - Data Evaluation
- Task 6 - Risk Assessment
- Task 7 - Treatability Study/Pilot Testing
- Task 8 - Remedial Investigation Report

The work elements comprising these tasks are discussed in the following subsections.

4.1 TASK 1 - PROJECT PLANNING

This task encompasses preparation and submittal of the Work Plan Memorandum (submitted to EPA on November 24, 1987), the Draft and Final Work Plan, and the Draft and Final Field Operations Plan. The activities that comprise this task are:

- Preparation of the Work Plan Memorandum;
- Review of EPA file data;
- Initial site visit;
- Preliminary identification of ARARs and determination of DQOs;

- o Preliminary identification of potential remedial alternatives;
- o Preliminary risk assessment (removed at the direction of the EPA);
- o Development of detailed field investigation activities, procedures, and specifications;
- o Preparation of the draft and final Work Plan;
- o Preparation of the draft and final Field Sampling and Analysis Plan;
- o Preparation of the draft and final Site Management Plan; (removed at the direction of the EPA) and
- o Preparation of the draft and final Health and Safety Plan.

The project plans prepared in Task 1 include two major documents:

- o Work Plan (WP): The present document, which presents the scope, rationale, and schedule for the Bluff Road RI/FS; and
- o Field Operations Plan (FOP), which is composed of two documents:
  - Field Sampling and Analysis Plan (FSAP) describing the details of sampling and analytical objectives; the number and location of samples for each media; the site specific quality assurance requirements; detailed sampling and analysis procedures; decontamination of sampling equipment procedures; and data management elements.
  - Health and Safety Plan (HASP) discussing site specific health and safety information, a hazard assessment, training requirements, health and safety monitoring procedures, personnel decontamination, disposal procedures, and any other procedure in accordance with the Health and Safety Plan. The HASP will be updated on a subtask specific basis as needed.

Task 1 will be completed upon EPA approval of the Work Plan and Field Operations Plan.

4.2 TASK 2 - COMMUNITY RELATIONS

Community relations activities are not addressed in this Work Plan.

4.3 TASK 3 - FIELD INVESTIGATION

This section outlines the various field investigations that will be conducted to collect the data required to meet the RI/FS objectives outlined in Section 3.4. To coordinate field activities and provide for a smooth transition between sampling efforts, three levels of field investigation will be conducted. The first level consists of an initial site reconnaissance visit which was conducted concurrent with the TASK 1 - PROJECT PLANNING activities. The second level (consisting of site screening activities) and third level (consisting of site characterization activities) comprise the main field investigation. They will be conducted sequentially, with only one initial mobilization required.

The following activities will be conducted during the field investigation of the Bluff Road Site:

- Site reconnaissance;
- Qualitative air monitoring;
- Private well inventory;
- Surface soil sampling;
- Surface water and sediment sampling;
- Groundwater screening of existing wells;
- Lagoon surface water and sediment sampling;
- Lagoon soil sampling;
- Installation and sampling of temporary wells;
- Soil boring and sampling;

- Groundwater investigations, including installation, sampling, and slug testing of new permanent monitoring wells;
- Aquatic biota survey;
- Abandonment of 11 existing monitoring wells; and
- Surveying.

The specific numbers and locations of the samples to be collected under each of these activities have been determined based on the data needs identified by Versar and through discussions with the EPA. Sampling locations have generally been selected to characterize the upgradient (background), onsite, and downgradient extent of contamination in the various media.

Some sampling events and locations have been selected to address specific issues raised by Versar. For example, Versar suspects that the shallow groundwater contaminant plume has migrated beyond the furthest downgradient monitoring well currently in place. That well will be sampled during the groundwater screening of existing wells (Section 4.3.6) to determine whether the plume has in fact reached or passed that point. The results of that sampling will be considered, along with the results of other screening events (e.g., surface soils and temporary wells), to finalize the locations and numbers of permanent monitoring wells.

These activities are discussed in the following subsections. Analysis of the collected samples are specified in Section 4.4.

4.3.1 Site Reconnaissance

The entire Bluff Road site will need to be visually inspected to identify waste disposal areas, above and below ground tanks, leachate seeps, and other areas of interest which may require investigation. A list of local telephone numbers and addresses will be needed for local supplies and services. Tax maps will be needed for property ownership for offsite sampling and drilling tasks.

4.3.2 Qualitative Air Monitoring

Onsite air quality monitoring investigations will encompass two regimes of air quality monitoring to meet the following objectives:

- o General site survey to establish and verify levels of personnel and public protection; and
- o Target area survey to qualitatively identify potential sources of organic vapor emissions.

4.3.3 Private Well Inventory

To define the current and potential use of both aquifers at the site, a well inventory will be conducted identifying potential receptors within one mile downgradient from the site. Private residences will be contacted to determine if a well(s) is located on the property and to identify its use, depth, construction method, and installation if known. This information will be used to define the groundwater classification and in risk assessment.

4.3.4 Surface Soil Screening

The delineation of the extent of soil contamination at this site has been based solely on the volatile organic analysis of 18 soil samples, and a priority pollutant scan of one composite soil sample. These samples were collected in January 1985. The Golder RI report provides no rationale as to how these 18 samples were chosen for chemical analysis, given that a total of 65 soil samples had been obtained.

Soil sample locations were mainly restricted to the fenced area of the Bluff Road Site. However, six soil samples were collected upgradient of the site. No soil samples were collected downgradient and outside of the fenced area.

The results of the chemical analysis of the 18 soil samples are suspect. Many of the analytical reports were issued in June 1985. However, the samples were collected in January 1985. If this discrepancy in time cannot be explained, the volatile organic analyses of the soil samples may be considered invalid due to inappropriate holding times prior to analysis.

The previous soil gas survey conducted as part of the Golder RI will be utilized as a starting point to determine the extent of soil contamination. Thirty-four surface soil samples will be collected and analyzed to screen out and/or identify contaminated areas of the site. In addition, upgradient background samples will be collected. Downgradient samples will be collected for detection of contaminant migration. Figures 4-1 and 4-2 show the approximate locations of the surface soil samples.

4.3.5 Surface Water and Sediment Sampling

The surface water medium which was not addressed in the Golder RI report will be defined during the completion of the RI.

SCDHEC conducted a preliminary investigation of the surface water regime in March 1980. This investigation focused on the drainage ditch which runs through the site, surface run-off, surface spills, and Myers Creek. A minimum number of samples were obtained in this investigation (i.e., one upgradient and one downgradient sample for each area). Therefore, the overall problem, if any, has not been defined.

The investigation indicated increased concentrations of metals and organics between sampling points located upstream and downstream of the Bluff Road Site in Myers Creek.

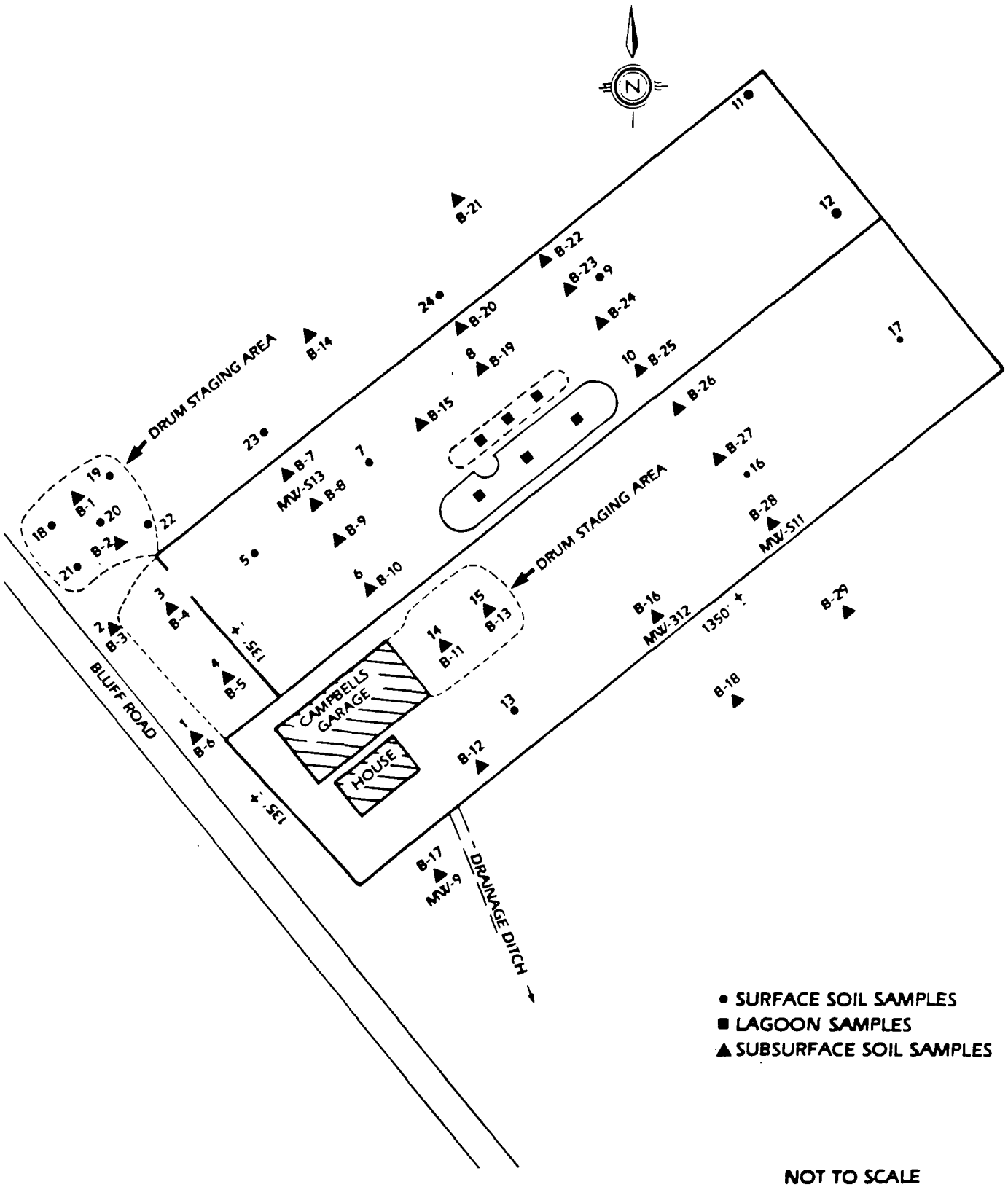
In addition, the report documented an intermittent stream which is believed to join Myers Creek. This drainage way originates in an area southeast of the fenced Bluff Road Site and empties into Myers Creek directly above the downstream sampling point utilized during the SCDHEC study.

As part of the activity needed to complete the RI, a series of water and sediment samples will be collected to determine the extent of contamination, if any, in the surface water regime at the Bluff Road Site.

Additionally, sediment samples will be collected (if possible) from surface run-off areas documented in the July 1980, SCDHEC report. The proposed sampling locations are shown on Figure 4-3.

Sampling of Myers Creek

Sampling of Myers Creek will include a series of sediment samples from the creek bed. This sediment sampling will be conducted in upstream and downstream locations to determine the extent of contamination that may have occurred.



REM III

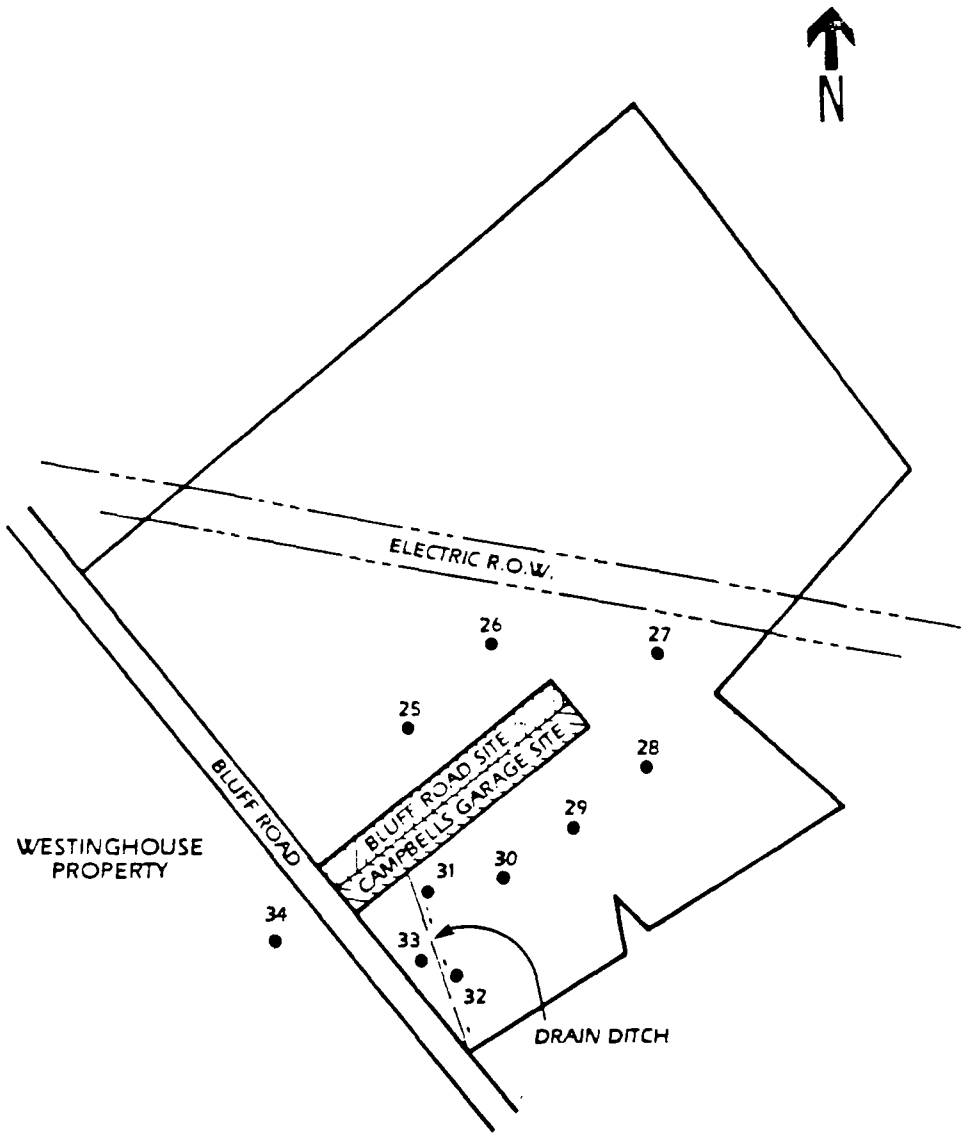
SITE SAMPLING

BLUFF ROAD SITE
COLUMBIA, SOUTH CAROLINA

EBASCO

FIGURE

4-1



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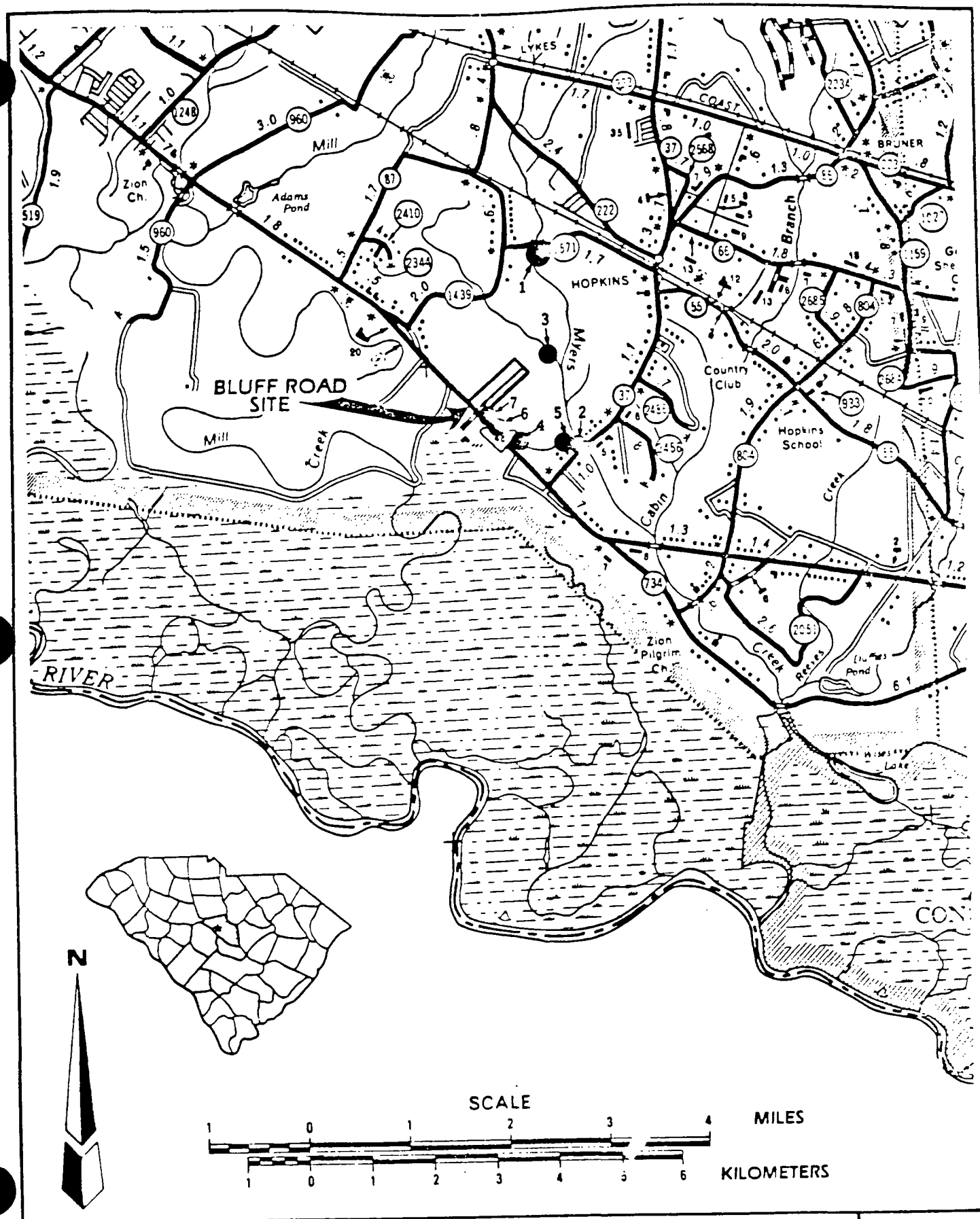
REM III
OFF SITE SURFACE SOIL SAMPLES
BLUFF ROAD SITE
COLUMBIA, SOUTH CAROLINA

FIGURE
4-2

EBASCO



REM III
SURFACE WATER AND SEDIMENT SAMPLING LOCATIONS
BLUFF ROAD SITE
COLUMBIA, SOUTH CAROLINA

EBASCO

FIGURE
4-3

Additionally, water samples will be collected from any tributary streams that may drain the Bluff Road Site and empty into Myers Creek. Water samples will also be collected at groundwater discharge points in Myers Creek.

Sampling of the Intermittent Stream

Sediment samples will be collected along the intermittent stream that joins Myers Creek southeast of the Bluff Road Site. This sampling may delineate the contribution of this stream to the contamination found in Myers Creek.

If possible, water samples will also be collected from the intermittent stream.

Sampling of the Drainage Ditch

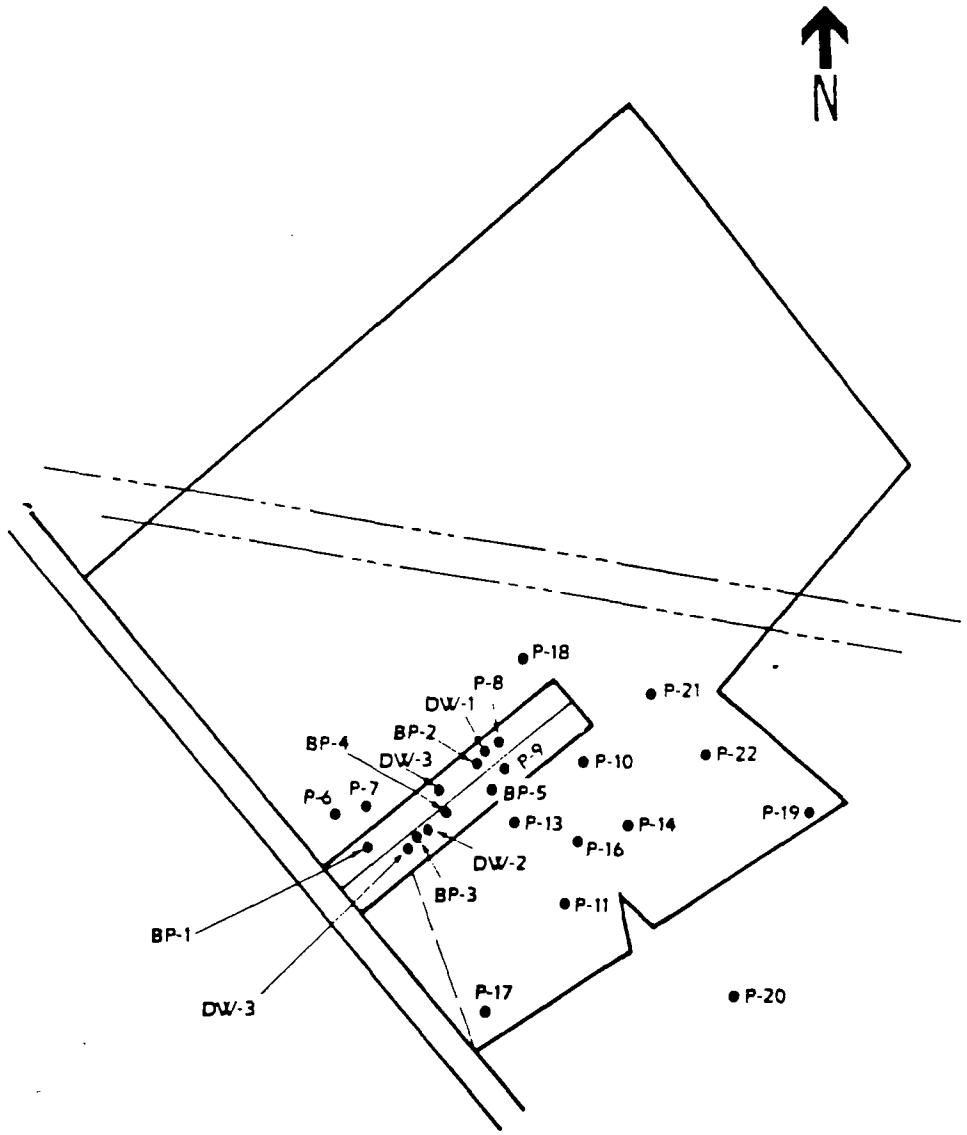
The drainage ditch, which may empty into the Congaree River, will also be sampled to determine if it may be contributing pollutants offsite. Sampling will consist of sediment and surface water collection.

4.3.6 Groundwater Screening

During previous investigations the overall water quality of both aquifers had not been clearly identified. Although numerous groundwater samples have been collected from the surficial aquifer at the site, only two of these samples have been subjected to a Target Compound List (TCL) scan. Additionally, the upgradient groundwater samples collected from well P-6, a surficial aquifer monitoring well, have had small amounts of organic compounds (<5 ppm) detected in the groundwater. Figure 4-4 shows the location of well P-6.

To more clearly identify water quality, 25 groundwater samples will be collected from existing monitor wells installed by Golder & Associates and analyzed for TCL metals and volatile organic compounds by a local laboratory for quick turnaround service. These data will aid in determining the rate at which the groundwater contaminant plume is migrating and provide guidance for new monitor well locations.

3 4 00260



NOT TO SCALE

REM III
EXISTING MONITER WELL LOCATIONS
BLUFF ROAD SITE
COLUMBIA, SOUTH CAROLINA

FIGURE
4

EBASCO

4.3.7 Lagoon Surface Water and Sediment Sampling

The Golder RI does include analyses of wastes from the onsite lagoon. However, this characterization consisted of one composite sample of lagoon water and one composite sample of lagoon sediment which were analyzed for target compound list analyses. Seven sediment cores were collected from the lagoon, however, only six samples were composited. No explanation was provided for this discrepancy in sample compositing. No analyses were conducted to define the composition of each layer within the lagoon. No samples were collected from the closed lagoon.

Additionally, the holding times of the samples collected for waste characterization are suspect. The analysis for volatile organics appears to have been completed in 33 days from the time of sample collection. The normal holding time for the completion of this analysis is 14 days.

To characterize the lagoon surface water and sediment quality, three locations will be used to collect samples at the open lagoon (see Figure 4-1). All samples will be collected in accordance with the procedures discussed in Section 4.6 and 4.11 of ESD SOPs. These samples will be analyzed by a CLP laboratory for TCL compounds.

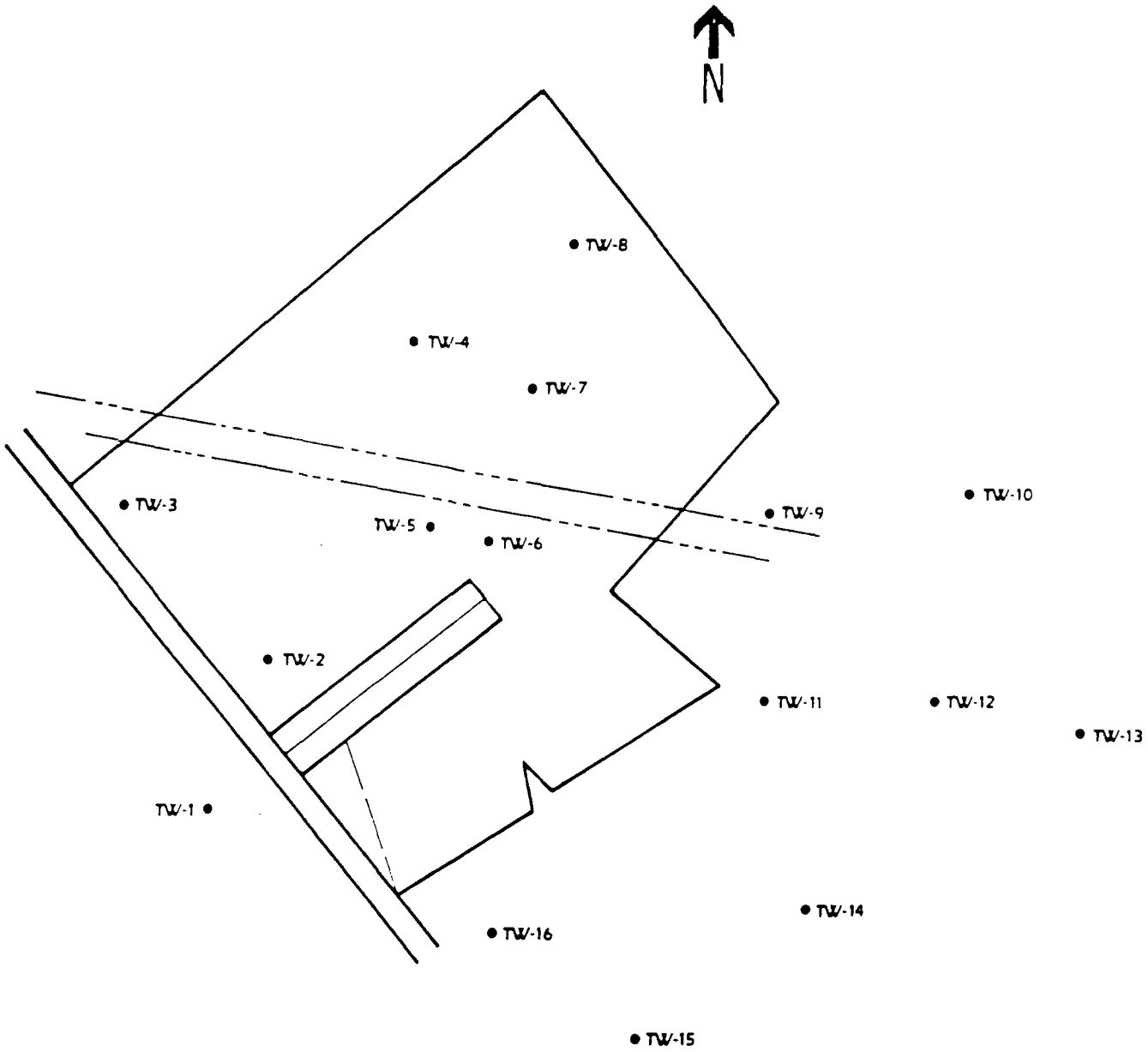
4.3.8 Lagoon Soil Sampling

Six soil sampling locations will be required at both the lagoons to determine the hazardous nature of the filled and open lagoons (see Figure 4-1).

The material will be sampled with a stainless steel hand auger and analyzed to determine the hazardous nature of the material. Appropriate holding times for samples prior to analysis will be maintained.

4.3.9 Installation and Sampling of Temporary Wells

In addition to the 25 existing wells, 16 groundwater samples will be collected from shallow (surficial aquifer) temporary wells (see Figure 4-5) to better define the extent of the groundwater plume migrating from the site. These samples will also be analyzed by a local laboratory for quick turnaround service. The samples will be analyzed for VOC and metals. These data, combined with existing monitor well samples, will provide for more accurate placement of new permanent monitor wells.



NOT TO SCALE

REM III
TEMPORARY WELL LOCATIONS
BLUFF ROAD SITE
COLUMBIA, SOUTH CAROLINA

EBASCO

FIGURE
4-5

4.3.10 Soil Boring and Sampling

To further identify the vertical and lateral extent of soil contamination, 29 soil borings will be completed within and near the study area at the Bluff Road site. Preliminary locations for these borings are shown on Figure 4-1. Exact locations will be determined in the field and will be based on information generated from the site screening investigation. These borings will be completed to identify contaminant concentrations and the general subsurface conditions. Samples will be collected in selected areas of the site as follows:

- Soil borings onsite for chemical analysis.
- Soil borings immediately downgradient of the site for chemical analysis.
- Soil borings immediately upgradient of the site for chemical analysis.

4.3.11 Groundwater Investigations, Including Installation, Sampling, and Slug Testing of New Permanent Monitoring Wells

Versar's review of the Golder Associates RI identified numerous data gaps and deficiencies in the groundwater monitoring investigative and methodological approach. The remedial groundwater monitoring tasks and methodology changes suggested by Versar are listed below:

- Eliminate compositing of groundwater samples.
- Define extent of contamination near the drainage ditch.
- Define extent of contamination near well P-18.
- Determine the extent of the contaminated groundwater plume.
- Determine overall water quality.
- Eliminate use of PVC and vyon (polyethylene) materials in well construction.

- Determine flow direction in lower aquifer.
- Define extent and composition of clay aquitard.

To eliminate the identified data gaps and deficiencies, approximately 17 shallow monitor wells and four deep monitor wells will be installed at and near the Bluff Road site. Figure 4-6 shows the preliminary well locations. The exact locations of the wells will be determined in the field and will be based on existing data and the data generated from the earlier screening activities. Slug tests will be performed to evaluate hydraulic conductivity of the aquifers and determine flow direction. Undisturbed soil samples will be obtained from the clay aquitard for analysis. All monitoring well construction will be stainless steel, and all groundwater samples will be analyzed by a CLP laboratory for TCL analysis.

4.3.12 Aquatic Biota Survey

The aquatic biota survey will determine the abundance and diversity of fish and benthic macroinvertebrates in the streams at the surface water sampling stations in the vicinity of the site (see Figure 4-3). The survey will be performed during the field investigation normal flow conditions. For all organisms observed, it will be determined if they are tolerant or intolerant species.

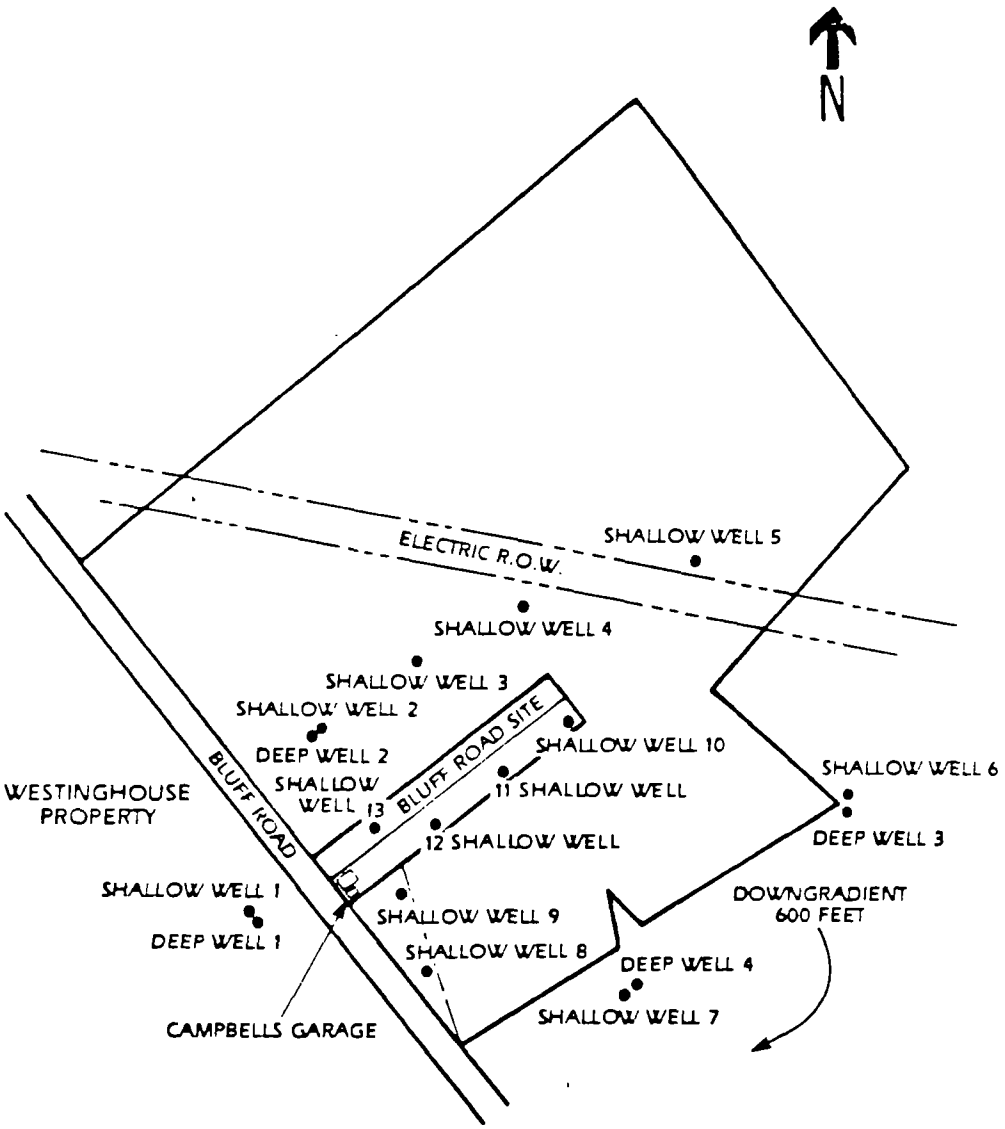
4.3.13 Abandonment of 11 Existing Monitoring Wells

The monitoring wells (W-1 to W-11) installed by SCDHEC will be located and properly abandoned because of questionable construction techniques. A survey by Golder Associates located eight of these wells, however, the remaining three should also be located, if possible, and properly abandoned.

4.3.14 Surveying

A subcontracted licensed surveyor will provide horizontal and vertical locations for all new monitor wells and locations of all soil borings. In addition, the surveyor will define the site area and provide a base map with all wells and borings located.

3 4 00265



NOT TO SCALE

REM III
MONITER WELL LOCATION MAP
BLUFF ROAD SITE
COLUMBIA, SOUTH CAROLINA

EBASCO

FIGURE
4-6

4.3.15 Onsite Tank

The onsite tank will be adressed in the FS if it is not removed as part of an expedited response action.

4.4 TASK 4 - SAMPLE ANALYSIS AND DATA VALIDATION

4.4.1 Sample Analysis

Table 4-1 identifies the media to be sampled, the number of samples of each medium, the number of associated QA/QC samples, the parameters for which the samples will be analyzed, and the laboratory at which the analyses will be carried out (CLP and/or local lab). Field analysis of pH, temperature and specific conductance will be carried out as specified in Region IV Environmental Services Division's Standard Operating Procedures (ESD SOPs).

4.4.2 Quality Control and Data Validation

Quality control (QC) during analysis through the CLP program is described by EPA's CLP Caucus for Inorganic Protocol (CLP-CIP) and Caucus for Organic Protocol (CLP-COP). Quality Control through the local laboratories is described in Appendix A of the FOP. Quality control for all other aspects of this task will be in accordance with the Region IV ESD SOPs. QC samples are included in Table 4-1.

Validation of laboratory analyses is a systematic process of reviewing a body of laboratory data to provide assurance that the data are adequate for their intended use. The process includes the following activities:

- Verifying system calibration
- Auditing quality control activities
- Verifying compound identification
- Auditing chain of custody and sample holding time
- Checking intermediate calculations
- Qualifying data when necessary

TABLE 4-1

SUMMARY OF SAMPLING TASKS AND RELATED QC REQUIREMENTS AND ANALYTICAL PARAMETERS

BLUFF ROAD SITE

COLUMBIA, SOUTH CAROLINA

Sampling Task	No. Of Samples and Media	No. Of Duplicate Samples	No. Of Field Blanks	No. Of Trip Blanks	Total No. of Samples	Analyses	Source of Analysis	Analytical Method	DQO Level of Analysis
Surface Soil Samples	34-soil	3	1	1	39	Ext. org, pest, PCB, volatile organics, metals, cyanide	Local	As specified in Appendix A	III
Surface Soil Sample Splits	3-soil	1		1	5	Ext. org, pest, PCB, volatile organics, metals, cyanide	CLP	RAS	IV
Existing Monitor Well Groundwater Samples	25-water	2	1	1	29	Volatile organics, metals, cyanide	Local	As specified in Appendix A	III
Existing Monitor Well Groundwater Sample Splits	2-water			1	3	Ext, org, pest, PCB, volatile organics, metals, cyanide	CLP	RAS	IV
Surface Water Samples	7-water	1	1	1	10	Ext. org, pest, PCB, volatile organics, metals, cyanide	CLP	RAS	IV
Sediment Samples	7-soil	1	1	1	10	Ext. org, pest, PCB, volatile organics metals, cyanide	CLP	RAS	IV

Note: A full set of analyses will be performed as poart of the trip blank.

TABLE 4-1 (Cont.)

SUMMARY OF SAMPLING TASKS AND RELATED QC REQUIREMENTS AND ANALYTICAL PARAMETERS

BLUFF ROAD SITE

COLUMBIA, SOUTH CAROLINA

Sampling Task	No. Of Samples and Media	No. Of Duplicate Samples	No. Of Field Blanks	No. Of Trip Blanks	Total No. of Samples	Analyses	Source of Analysis	Analytical Method	DQO Level of Analysis
Lagoon Surface Water Samples	3-water		1		4	Ext. org, pest, PCB, volatile organics, metals, cyanide	CLP	RAS	IV
Lagoon Sediment Samples	3-soil		1		4	Ext. org, pest, PCB, volatile organics, metals, cyanide	CLP	RAS	IV
Lagoon Soil Samples	6-soil	1	1	1	9	Ext. org, pest, PCB, volatile organics, metals, cyanide	CLP	RAS	IV
Groundwater Temporary Wells	16-water	1	1	1	19	Volatile organics, metals, cyanide	Local	As specified in Appendix A	III
Split Spoon Samples	87-soil	9	1	1	98	Ext. org, pest, PCB, volatile organics, metals, cyanide	CLP	RAS	III

*If conditions permit

Note: A full set of analyses will be performed as poart of the trip blank.

TABLE 4-1 (Continued)
SUMMARY OF SAMPLING TASKS AND RELATED QC REQUIREMENTS AND ANALYTICAL PARAMETERS
BLUFF ROAD SITE
COLUMBIA, SOUTH CAROLINA

Sampling Task	No. Of Samples and Media	No. Of Duplicate Samples	No. Of Field Blanks	No. Of Trip Blanks	Total No. of Samples	Analyses	Source of Analysis	Analytical Method	DQO Level of Analysis
Split Spoon Sample Splits	9-soil	1	1	1	12	Ext. org, pest, PCB, volatile organics, metals, cyanide	CLP	RAS	IV
Groundwater Samples New Monitor Wells	21-water	2	1	1	26	Ext. org, pest, PCB, volatile organics, metals, cyanide	CLP	RAS	IV
*Runoff Sediment Samples	5-soil			1	6	Ext. org, pest, PCB, volatile organics, metals, cyanide	CLP	RAS	IV

*If conditions permit

Note: A full set of analyses will be performed as part of the trip blank.

The review and validation of CLP and local laboratory data will be performed according to the current Region IV ESD QA/QC guidelines.

4.5 TASK 5 - DATA EVALUATION

The purpose of this task is to organize the validated data collected from the field and laboratories into a working format for analysis, and then perform the necessary calculations and evaluations to meet the project objectives. Task 5 has two distinct components: data reduction and data evaluation. Brief descriptions of these components follow.

4.5.1 Data Reduction

Data obtained from the various field investigations will be condensed and organized to facilitate evaluation and presentation in this subtask. Reduction of data will result in the production of various tables, figures and drawings describing and summarizing the pertinent site features. These might include:

- Figures displaying boring and monitoring well locations
- Various hydrogeologic cross-sections
- Groundwater contour maps
- Contaminant contour maps

Data reduction will be facilitated by computerization. The computerized sampling and analytical data base will be amenable to manipulation and creation of different sorting profiles. Sorting profiles will assist in evaluating the occurrence and distribution of contaminants within the different media. Appropriate tables, maps and figures will be produced to summarize the occurrence and distribution of contaminants on and migrating from the Bluff Road site.

4.5.2 Data Evaluation

Once the data are reduced to a usable format, they will be reviewed and evaluated in order to determine if the RI project objectives have been met. The data will be evaluated in such a manner as to allow a comparative evaluation of the remedial alternatives.

4.6 TASK 6 - BASELINE PUBLIC HEALTH/ENVIRONMENTAL ASSESSMENT

The baseline public health/environmental assessment will address the potential human health and environmental effects associated with the Bluff Road site under the no-action alternative. The no action alternative assumes that no remedial (corrective) action will take place at the site. Evaluation of the no-action alternative is required under Section 300.68(f)(v) of the National Contingency Plan (NCP).

There are two objectives to the baseline assessment. First, the assessment provides information that can be used to evaluate the need for remediation based on the potential health and environmental risks posed by the site and identify other exposure pathways that potentially contribute to the baseline risk. Second, the baseline assessment will provide a basis for determining the reduction in potential environmental exposure resulting from the different remedial actions to be evaluated in the feasibility study and thus provide part of the basis for selecting a remedial alternative for the site.

The main steps in this assessment will be performed in accordance with the latest EPA policy and guidance on risk assessments in general and for Superfund sites in particular. These steps are:

- Baseline Site Assessment;
- Exposure Assessment;
- Environmental Assessment; and
- Comparison of Environmental considerations with ARARs.

4.6.1 Baseline Site Assessment

After completion of the RI effort, the chemical data will be compiled and reviewed. A list of compounds of concern will then be prepared. Toxicology data on the identified contaminants will be gathered from EPA sources and other literature. Whenever reference doses (Rfd), potency factors, or other toxicological information have been published by the EPA, these parameters will be used. In the absence of published EPA information, the available literature will be consulted for toxicological information.

Indicator compounds will then be selected from the list of compounds of concern. The information to be used in this selection will be toxicological data, contaminant concentrations, and chemical characteristics. The indicator chemicals will be selected according to toxicity, environmental concentration, available toxicological information, and contaminant class representativeness. The indicator compounds will then be used in the exposure assessment.

4.6.2 Exposure Assessment

The previously suggested exposure routes (see Section 3.1) will be reexamined in light of the RI data. Exposure point concentrations will be documented by using actual measurements, by modeling, or by interpolation. The methods of modeling or interpolation cannot be identified at this time, because of the uncertainty of compound distribution in the site media. If modeling is necessary, the models will be selected from available literature (i.e., EPA publications and reviewed journals). All models and assumptions will be documented in the report and supplemented with appendices as appropriate.

Chemical intakes for each human exposure scenario will be estimated based on frequency and duration of exposure and rate of media intake (e.g., amount of water ingested per day). Human exposure is expressed in terms of intake which is the amount of a substance taken into the body per unit body weight per unit time. A chronic daily intake (CDI) is averaged over a lifetime for carcinogens and over the exposure period for noncarcinogens. The CDI is calculated separately for each exposure pathway, since different populations-at-risk may be affected by the individual pathways. The assumptions used in this risk assessment will be selected to represent an "average exposure case" and a "plausible maximum case".

The exposure assessment will use simple models to estimate the risk or hazard index from the previously developed pathway exposure levels or body burden. Since estimates or results from models will be used to define the body burden and no one single value is the "right one", a range of values will be produced. A series of distributions will be formulated to represent these ranges. For example, not everyone will be exposed exactly for 30 years, but a range of 10 to 50 years might be appropriate. Another example is that instead of being exposed to 30 mg/kg/day the person is exposed to 0.5 to 100 mg/kg/day. These parameter

distributions will be used in a computer program developed by Ebasco to estimate the probability of risk by a random Latin Hyper-Cube sampling procedure. The results will be expressed as the medium estimate and associated range. A realistic appraisal of the risk associated with exposure to the contaminants at the Bluff Road site can then be made.

4.6.3 Environmental Assessment

Site chemical data, exposure point estimates, and biological monitoring data will be evaluated with respect to the potential environmental effects of site contaminants. The flora and fauna of the site will be included in this assessment. The type of flora and fauna to be considered will be developed by direct observation and contrasted with the most probable species to be present given the site location and history. The environmental assessment will be limited in scope and a full modeling and speciation count will not be attempted.

4.6.4 ARAR Comparison

In addition to critical toxicity values, any applicable or relevant and appropriate requirements (ARARs) that have been identified by the state of South Carolina will be used to evaluate the site. The ARARs will be compared to the exposure point estimates previously developed to determine applicability of remedial actions. Specifically, the potential of the no action alternative will be discussed. Currently, the EPA considers maximum contaminant levels (MCLs) developed under the Safe Drinking Water Act, Federal Ambient Water Quality Criteria (AWQC), National Ambient Air Quality Standards (NASQS), and state environmental laws to represent potential ARARs for use in risk assessment at Superfund sites. ARARs are discussed in Section 3.2 of this Work Plan.

4.7 TASK 7 - TREATABILITY STUDY/PILOT TESTING

As part of the Golder RI, laboratory treatability studies were conducted on soil and groundwater samples collected at the Bluff Road Site. The specific tests conducted were as follows:

1) Soil leachability study;

2) Volatile Organics Stripping for ground water; and

3) Soil Aeration.

The soil leachability and groundwater stripping studies concluded that volatile organic contamination could be removed utilizing these technologies. The studies also concluded that these methods are viable remedial alternatives at the Bluff Road Site. However, further study was recommended.

The soil aeration study was not completed due to the curtailment of the project.

During the RI, samples of the soil and groundwater will be analyzed for physical as well as chemical characteristics. The test results will be evaluated to determine the feasibility of the technologies being screened.

The evaluation of RI data may indicate that other specific treatability/compatibility testing may be required in addition to this physical/chemical data, for evaluation of technologies. These studies would be conducted as part of the RI. Treatability studies may be necessary to fully evaluate the feasibility of the technologies.

If evaluation of RI data indicates site-specific treatability/ compatibility studies, or other pilot testing are necessary to complete the FS, an Engineering Evaluation and Cost Analysis for these activities will be prepared for review and approval by the EPA.

4.8 TASK 8 - REMEDIAL INVESTIGATION REPORT

The Remedial Investigation report task includes all work efforts related to the documentation of the results once the data have been evaluated and the risk assessment performed. This task covers both the draft and final remedial investigation report.

4.8.1 Draft Report Preparation

Following completion of the data evaluation and risk assessment tasks, a draft Remedial Investigation report will be prepared for submission to the EPA. The report will address the following:

- Soil quality data
- Surface water and sediment quality data
- Groundwater quality data
- Monitor well construction comparison results
- Site-specific hydrogeologic data
- Contaminant source and migration evaluation results
- Risk assessment results
- Conclusions and recommendations

4.8.2 Graphics Preparation

This subtask includes the preparation of all graphics to be included in or with both the draft and final Remedial Investigation report. These graphics may include but are not limited to:

- o Site maps
- o Contour maps
- o Plume diagrams
- o Hydrogeologic cross-sections
- o Well location maps
- o Sampling location maps

4.8.3 Draft Report Printing/Distribution

This subtask includes all work efforts associated with reproducing and distributing the draft remedial investigation report to the appropriate review parties, as directed by the EPA. No more than 15 copies are anticipated.

4.8.4 Review Meeting

A review meeting will be held with representatives from all the appropriate review agencies and parties to discuss comments addressing the results, conclusions, and recommendations in the draft Remedial Investigation report. After completion of the meeting, minutes will be prepared and distributed to all review meeting participants. In addition, a follow-up memorandum addressing all comments submitted in writing by the review meeting participants will be prepared and submitted to the EPA.

4.8.5 Final Report Preparation

After the EPA and other agencies review the draft Remedial Investigation report, a final Remedial Investigation report will be prepared for submission to the EPA. All appropriate comments generated by the review participants will be incorporated in the final report.

4.8.6 Final Report

This subtask includes all work efforts associated with reproducing and distributing the final Remedial Investigation report to the appropriate parties, as directed by the EPA. No more than 30 copies are anticipated.

This subtask also includes participation in a public meeting to present the RI findings. Additional post RI and FS activities will be conducted under Task 12 (Section 5.4).

5.0 TASK PLAN FOR THE FEASIBILITY STUDY

The completion of the following tasks will be necessary in order to complete a Feasibility Study (FS) for the Bluff Road Site. Golder Associates did not submit a FS as part of the RI report. Therefore, all steps of the FS are yet to be conducted. It should be noted, however, that some treatability studies were conducted as part of the previous Golder RI (see Section 4.7). All usable information on the results of these studies will be incorporated into the FS.

The Feasibility Study will consist of the following five standard FS tasks:

- Task 9 - Remedial Alternatives Screening,
- Task 10 - Remedial Alternatives Evaluation,
- Task 11 - Feasibility Study Report,
- Task 12 - Post RI/FS Support, and
- Task 15 - EPA Planning (see Section 3.3.4)

Tasks 9, 10, and 15 will be initiated as early in the RI/FS process as possible. Many activities will be performed concurrently rather than sequentially among these tasks in order to expedite the FS process. The approach taken in the FS will follow the EPA guidance document, "Guidance on Feasibility Studies under CERCLA" and the Section 121 provisions of SARA. The overall objective of the FS will be to determine an appropriate remedial action (or actions) for known contaminated locations.

In developing and evaluating potential remedial actions, consideration will be given to the following factors:

- Compliance with ARARs;
- Reduction of toxicity, mobility and volume;
- Short-term effectiveness;
- Long-term effectiveness and permanence;

- o Implementability;
- o Cost;
- o Community reaction;
- o State acceptance; and
- o Overall protection of human health and the environment.

5.1 TASK 9 - REMEDIAL ALTERNATIVES SCREENING

In this task, remedial alternatives will be screened as the first step in the FS process. This task will employ data collected in the RI Field Investigation (Task 3) and Risk Assessment (Task 6). The subtasks comprising Task 9 will accomplish the following objectives:

- o Refine the preliminary remedial objectives identified during the scoping process (see Section 3.3) under Task 1 and finalize the objectives;
- o Refine the preliminary remedial technologies identified during the scoping process (see Section 3.3) under Task 1, finalize the list of applicable remedial technologies and assembly of alternatives; and
- o Screen remedial technologies/alternatives.

5.1.1 Development of Remedial Response Objectives

Based on the results of the RI, the nature and extent of the problem at the site will be defined. This definition will include types of contamination at the site, the source of the contamination, migration pathways of concern at the site, and potential receptors at or near the site. Any changes to the original description of the nature and extent of the problem at the site included in the RI Work Plan will be discussed and justified based on results of the remedial investigation.

Following this summary of the current situation, a site-specific statement of purpose for the response, based on the results of the remedial investigation, will be developed. The statement of

purpose will identify the actual or potential exposure pathways that should be addressed by remedial alternatives. The statement of purpose will also finalize the site-specific remedial response objectives identified in Section 3.3 and establish criteria for the development and evaluation of alternatives.

These remedial response objectives shall be based on public health and environmental concerns, information gathered during the remedial investigation, CERCLA as amended by SARA, the National Contingency Plan (NCP) and any amendment thereto, EPA guidance, 40 CFR 264 (RCRA), Federal and State water quality standards including narrative toxicity standards, and the requirements of any other applicable or relevant and appropriate federal or state requirement (ARARs), standard, criteria, limitation, or statutes.

5.1.2 Identification of Applicable Technologies and Assembly of Alternatives

Based on the site-specific problems and statement of purpose developed under Section 5.1.1, a specific list of potentially feasible remedial technologies will be developed. These remedial technologies will include both onsite and offsite remedies, depending on site problems. The specific list will be developed from a general list by screening technologies based on site conditions, waste characteristics, and technical requirements in order to eliminate or modify those technologies that may prove extremely difficult to implement, will require unreasonable time periods, or will rely on insufficiently developed technology.

5.1.2.1 Identification of General Response Actions

Using the definition of the nature and extent of the problems as a guide, the list of general response actions found in Table 3-3 (Section 3.3) will be reviewed and those actions which are applicable to site problems identified.

5.1.2.2 Identification of Specific Remedial Technologies

For each general response action identified as being applicable to site problems, the specific remedial technologies associated with it will be reviewed for suitability to remedy site problems. The typical remedial technologies associated with general response actions were listed on Table 3-4 (Section 3.3). A more extensive list of remedial technologies is included in Appendix A.

The review of remedial technologies will identify specifically to which portion of the site problem each remedial technology is applicable and the degree to which it will mitigate the problem. Also, any site characteristics or waste characteristics that might alter the effectiveness of a remedial technology at the Bluff Road Site will be noted. Table 3-5 (Section 3.3) lists some of the site and waste characteristics to be considered.

5.1.2.3 Development of Alternatives

Given the final remedial response objectives developed earlier (Section 5.1.1), the applicable remedial technologies will be combined to form remedial action alternatives for the site. These alternatives will address site problems by controlling the source of contaminants, managing the migration of contaminants, or both.

To the extent that it is both feasible and appropriate, treatment alternatives for source control actions will be developed ranging from an alternative that would eliminate the need for long-term management (including monitoring) at the site, to an alternative using, as a principal element, treatment that would reduce the toxicity, mobility, or volume of site waste. An alternative involving treatment as a principal element is one that uses treatment technologies to reduce the principal threats posed by the site. A number of alternatives within the above range will be considered for the site.

In addition, groundwater treatment alternatives for managing migration of contaminants will be developed over a performance range that is defined in terms of a remediation level within the probability range of 10^{-4} to 10^{-7} for maximum lifetime risk and including different rates of restoration. If feasible, one alternative will be configured that will restore ground water to a 10^{-6} probability level for maximum lifetime risk within five years.

5.1.3 Screening of Remedial Technologies/Alternatives

The alternatives developed under Section 5.1.2 will be screened to eliminate those that are clearly infeasible or inappropriate. This initial screening will be conducted prior to undertaking detailed evaluations of the remaining alternatives. The purpose of the screening step is to reduce the number of alternatives requiring detailed analysis while preserving a range of options.

This screening is accomplished by considering the public health effects, environmental impacts, technical feasibility, and cost of each alternative relative to the other alternatives. Specifically the factors to be considered in each area are as follows:

1) Public Health Effects: Only those alternatives that satisfy the response objectives and contribute substantially to the protection of public health, welfare, or the environment will be considered further. Source control alternatives will achieve adequate control of source materials. Management of migration alternatives will minimize or mitigate the threat of harm posed by the contaminates at the site to public health, welfare, or the environment;

2) Environmental Effects: Alternatives posing significant adverse environmental effects will be excluded;

3) Technical Feasibility: Technologies that may prove extremely difficult to implement, will not achieve the remedial objectives in a reasonable time period, or will rely upon unproven technology will be modified or eliminated. If there is reasonable belief that an innovative technology offers potential for better treatment performance or implementability, fewer or lesser adverse impacts than other available approaches, or lower costs than demonstrated technologies, then it should be carried through this screening; and

4) Cost: An alternative whose cost far exceeds that of other alternatives which provide similar results will usually be eliminated unless other significant benefits may also be realized. (Note that cost may be compared among treatment alternatives, but not between treatment and non-treatment alternatives) Total costs will include the cost of implementing the alternatives and the cost of operation and maintenance.

   The cost screening will be conducted only after the environmental, public health, and technical screenings have been performed.

In some situations the above factors could occasionally result in elimination of alternatives which involve treatment of the source as the principal element. Upon completion of the screening, the six alternatives found to be most feasible will be presented to the EPA in a technical memorandum.

Documentation for this screening process will be provided in the FS report. The rationale for elimination of any alternatives will be presented in detail. Those alternatives that pass the initial screening in Task 9 will be carried forward for detailed evaluation in Task 10.

5.2 TASK 10 - REMEDIAL ALTERNATIVES EVALUATION

The alternatives passing through the initial screening will be analyzed in further detail against a range of factors and compared against one another.

The effectiveness of the alternatives will be assessed, taking into account whether or not (1) an alternative adequately protects human health and the environment and attains Federal and State ARARs, (2) whether or not it significantly and permanently reduces the toxicity, mobility, or volume of hazardous constituents, and (3) whether or not it is technically reliable.

Alternatives will be evaluated against implementability factors, including (1) the technical feasibility and availability of the technologies each alternative would employ, (2) the technical and institutional ability to monitor, maintain, and replace technologies over time, and (3) the administrative feasibility of implementing the alternative.

Finally, the costs of construction and the long-term costs of operating and maintaining the alternatives will be analyzed using present-worth analysis.

Both the short- and long-term effects of each of these factors will be assessed. In considering these items, all of the long-term effectiveness factors cited in SARA Sec. 121 (b) (1) will be addressed. After each alternative has been analyzed against these factors, the remedial options will be compared for their relative strengths and weaknesses.

The detailed evaluation will include, at a minimum, the following specific analyses:

5.2.1 Technical Analysis

The technical analysis will include, as a minimum:

1) A description of appropriate treatment and disposal technologies including the intent of the remedial alternative (e.g., source control or management of migration);

2) Special engineering considerations required to implement the alternatives (e.g., pilot treatment facility, additional studies needed to proceed with final remedial design);

3) Discussions of how the alternative does (or does not) comply with specific requirements of other environmental programs. When an alternative does not comply, a discussion of how the alternative prevents or minimizes the migration of wastes and public health or environmental impacts and a description of special design needs that could be implemented to achieve compliance;

4) Operation, maintenance, and monitoring requirements of the remedy;

5) Identification and review of potential offsite facilities to ensure compliance with applicable RCRA, and other EPA environmental program requirements, both current and proposed. Potential disposal facilities will be evaluated to determine whether offsite management of site wastes could result in a potential for a future release from the disposal facility;

6) Temporary storage requirements;

7) Safety requirements for remedial implementation (including both onsite and offsite health and safety considerations);

8) A description of how the alternatives could be phased into operable units. The description includes a discussion of how various operable units of the total remedy could be implemented individually or in groups, resulting in a significant improvement in the quality of the environment or savings in cost;

9) A description of how the alternatives could be segmented into areas to allow implementation of different phases of the alternative;

10) An assessment of local residents' perception of the impact of the alternative;

11) Aspects of the site conditions that the alternative will or will not control;

12) The performance of a remedial alternative based on its effectiveness and useful life. Effectiveness refers to the degree to which an action prevents or minimizes substantial danger to public health, welfare, or the environment. This is usually accomplished via certain functions (i.e., containment, diversion, removal, destruction, or treatment). The effectiveness of an alternative should be determined either through design specifications or by performance evaluation. The useful life of an alternative is the length of time this level of effectiveness can be maintained. Each alternative will be evaluated in terms of the projected service lives of its component technologies;

13) The reliability of a remedial alternative which includes its operation and maintenance requirements and demonstrated reliability at similar sites. Operation and maintenance (O&M) requirements should be assessed by the availability and cost of necessary labor and materials, and by the frequency and complexity of O&M activities. The demonstrated performance of an alternative should include an estimate of the probability of failure in qualitative or quantitative terms for each component technology and for the complete alternative. Although preference will be given to technologies previously

demonstrated under similar site and waste conditions, innovative or developmental technologies may be evaluated as an alternative. Their evaluation may be based on bench scale tests completed during the RI, if appropriate, and researchers' laboratory and field tests;

14) An analysis of whether recycle/reuse, waste minimization, waste biodegradation, waste destruction, or other advanced, innovative, or alternative technologies are appropriate to reliably minimize present or future threats to public health, welfare, and the environment;

15) Safety criteria such as the security and freedom from risk, loss, injury, harm, and danger. Each remedial action alternative will be evaluated with regard to safety. Factors to be considered in this evaluation will include short- and long-term threats to the safety of the remedial workers, the community living and working in the site vicinity and the environment and facilities during implementation of the remedial measures; and

16) An analysis of agencies which can provide valuable assistance in the implementation of an alternative. All agencies with which consultations will be needed will thus be listed. A partial list may include the:

- U.S. Dept. of Commerce (NOAA),
- National Park Service,
- Federal Emergency Management Agency,
- Department of Health and Human Services,
- U.S. Army Corps of Engineers,
- U.S. Geological Survey,
- Occupational Safety and Health Administration, and
- U.S. Department of Interior (U.S. Fish & Wildlife Service).

5.2.2 Environmental Analysis

The environmental analysis will at a minimum involve performing an Environmental Assessment (EA) for each alternative. The EA should focus on the site problems and pathways of contamination actually addressed by each alternative. The EA for each

alternative will include, at a minimum, an evaluation of beneficial effects of the response, adverse effects of the response, and an analysis of measures to mitigate adverse effects. The no-action alternative will be fully evaluated to describe the current site situation and anticipated environmental conditions if no actions are taken. The no-action alternative will serve as the baseline for the analysis.

5.2.3 Institutional Analysis

The institutional analysis will at a minimum involve evaluating each alternative based on its relevant institutional needs. Specifically, regulatory requirements, permits, community relations, and participating agency coordination will be assessed.

5.2.4 Public Health Analysis

The public health analysis will involve evaluating each alternative in terms of the extent to which it will mitigate damage to public health in comparison to the other remedial alternatives.

The public health analysis consists of a baseline site assessment, an exposure assessment, and a comparison of environmental considerations to relevant and applicable standards. First, a baseline site evaluation is conducted where all data on the extent of contamination, contaminant mobility and migration, and types of alternatives are reviewed. The result of the baseline evaluation is the determination of data required to conduct an exposure assessment and the level of detail in this assessment.

Second, an exposure assessment will be conducted. A qualitative exposure assessment is required for source control actions to evaluate the types, amounts, and concentrations of chemicals at the site, their toxic effects, the proximity of target populations, the likelihood of chemical release and migration from the site, and the potential for exposure. A quantitative exposure assessment is conducted for management of migration actions to estimate the frequency, magnitude, and duration of human exposure to toxic chemical contaminants released from a site.

Following the exposure assessment, estimated environmental concentrations of the indicator chemicals selected for the site (if there are a large number of chemicals present) will be compared to applicable or relevant environmental standards such as those found in RCRA regulations, National Interim Primary Drinking Water Standards, Maximum Contaminant Levels, National Ambient Air Quality Standards, EPA and State water quality standards including narrative toxicity standards, as well as EPA criteria for noncarcinogens, carcinogens, and health advisories. When no applicable standard exists, at least one alternative should be aimed at a 10-6 lifetime health risk level, and other alternatives in the 10-4 to 10-7 lifetime health risk level.

5.2.5 Cost Analysis

The cost of each feasible remedial action alternative remaining after initial screening will be evaluated and will include each phase or segment of the alternative and consider cost and non-cost (i.e., loss of natural resources) criteria. The cost of each alternative will be presented as a present worth cost and includes the total cost of implementing the alternative and the annual operating and maintenance cost of implementing the alternative. A distribution of costs over time will also be provided. A table showing the above cost information for each alternative will be included.

In developing detailed cost estimates, the following steps will be performed:

1) Estimation of Costs: Determine capital and annual operating costs for remedial alternatives;

2) Cost Analysis: Using estimated costs, calculate the stream of payments and present worth for each remedial alternative; and

3) Sensitivity Analysis: Evaluate risks and uncertainties in cost estimates; cost estimates should be within +50% and -30% of the actual cost.

5.2.6 Summary of Alternatives

Using a comparative format, the results of the detailed technical, institutional, public health, and environmental

evaluations of each alternative will be summarized. At a minimum, the following areas will be used to compare alternatives:

1) Present Worth of Total Costs: The net present value of capital, operating, and maintenance costs will be presented;

2) Health Information: For the no-action alternative, a quantitative statement including a range estimate of maximum individual risks will be prepared. If quantification is not possible, a qualitative analysis will be prepared. For source control options, a quantitative risk assessment will not be prepared. For management of migration measures, a quantitative risk assessment including a range estimate of maximum individual risks will be prepared;

3) Environmental Effects: Only the most important effects or impacts will be summarized. Reference will be made to supplemental information arrayed in a separate table, if necessary;

4) Technical Aspects of the Remedial Alternatives: The technical aspects of each remedial alternative relative to the others will be clearly delineated. The information generally will be based on the professional opinion of the engineer regarding the site and the technologies comprising the remedial alternative;

5) Information on the Extent to Which Remedial Alternatives Meet the Technical Requirements and Environmental Standards of Applicable Environmental Regulations: This information will be arrayed so that differences in how remedial alternatives satisfy such standards are readily apparent. The general types of standards that could be applicable at the site include:

   - RCRA design and operating standards; and

   - EPA and State drinking water standards and criteria, including narrative toxicity standards;

6) Information on Community Effects: The type of information that will be provided is the extent to which implementation of a remedial alternative disrupts the community (e.g., traffic, temporary health risks, and relocation); and

7) Other Factors: This category of information will include such things as institutional factors that may inhibit implementing a remedial alternative and any other site-specific factors identified in the course of the detailed analysis that may influence which alternative is eventually selected.

5.3 TASK 11 - FEASIBILITY STUDY REPORT

Task 11 will consist of the following subtasks:

- Summarize each alternative in terms of detailed technology, reliability, implementability, public health, environment, institutional requirements, and cost evaluation;
- Compare the remedial alternatives;
- Prepare the FS Report.

The FS Report will include an executive summary, an introduction and a description of the screening and evaluation process.

The FS report will include a summary of the detailed technical and cost evaluations and a comparative evaluation of the remedial alternatives. This summary will be presented as table matrices. Backup information will be included as appendices. A proposed FS Report outline is presented in Table 5-1.

5.4 TASK 12 - POST RI/FS SUPPORT

The PRPs will provide support to EPA for any requested assistance in activities that occur after the Bluff Road site RI/FS is completed. The scope for this effort, if needed, will be determined in meetings with EPA after the RI/FS report is approved and support activities identified.

TABLE 5-1

EXAMPLE FEASIBILITY STUDY REPORT FORMAT

Executive Summary

1.0 INTRODUCTION

2.0 PUBLIC HEALTH EVALUATION

3.0 OBJECTIVES OF REMEDIAL TECHNOLOGIES

4.0 SCREENING OF REMEDIAL ACTION TECHNOLOGIES

5.0 ASSEMBLY AND SCREENING OF REMEDIAL ACTION ALTERNATIVES DEVELOPED

- 5.1 ENVIRONMENTAL AND PUBLIC HEALTH CRITERIA
- 5.2 COST CRITERIA

6.0 DESCRIPTION OF REMEDIAL ACTION ALTERNATIVES

7.0 DETAILED EVALUATION OF REMEDIAL ACTION ALTERNATIVES

- 7.1 TECHNICAL ANALYSIS OF ALTERNATIVES
- 7.2 ENVIRONMENTAL EVALUATION OF ALTERNATIVES
- 7.3 INSTITUTIONAL REQUIREMENTS EVALUATION
- 7.4 PUBLIC HEALTH EVALUATION OF ALTERNATIVES

8.0 SUMMARY OF ALTERNATIVES

REFERENCES

APPENDIX

- A ARARs
- B RISK ASSESSMENT
- C DETAILED COST ANALYSIS

5.5 TASK 15 - ERA PLANNING

An above ground tank currently remains on the Bluff Road site. The Golder RI report indicated that this tank contains sludge that is highly contaminated with 2-chlorophenol and phenol. Ebasco believes that an Expedited Response Action (ERA) directed toward remediation of this tank may be warranted.

Two PRPs will evaluate the current situation regarding the tank, utilizing information from previous studies, and provide an Engineering Evaluation and Cost Analysis describing the type and extent of an ERA that could be implemented. This will be provided within 30 days of approval of the Final Work Plan.

The need for any additional sampling of the tank will be discussed in the EE/CA. If the EPA does not elect to conduct an expedited tank response action, the tank will be addressed during the Feasibility Study as described in Sections 5.1 through 5.4 above.

6.0 PROJECT MANAGEMENT APPROACH

6.1 QUALITY ASSURANCE AND DATA MANAGEMENT

The site-specific quality assurance requirements will be in accordance with the Region IV ESD SOPs. The ESD SOPs provide general guidance on several subjects including QA objectives for measurement of data in terms of precision, accuracy, representativeness, completeness, and comparability.

Data management aspects of the program pertain to controlling and filing documents. The PRPs will develop a program filing system that conforms to the requirements of the EPA to ensure that the integrity of the documents is safeguarded. The program will be implemented to control and file all documents associated with the Bluff Road RI/FS. The system will include document receipt control procedures, a file review and inspection system, and security measures to be followed.

6.2 PROJECT SCHEDULE

A detailed schedule of tasks and activities for the Bluff Road RI/FS will be preparedd by the PRPs and submitted to EPA for approval of field investigations.

APPENDIX A - REMEDIAL TECHNOLOGIES

A. Air Pollution Controls

- o Capping
  - Synthetic membranes
  - Clay
  - Asphalt
  - Multimedia cap
  - Concrete
  - Chemical sealants/stabilizers
- o Dust Control Measures
  - Polymers
  - Water

B. Surface Water Controls

- o Capping (see A.)
- o Grading
  - Scarification
  - Tracking
  - Contour furrowing
- o Revegetation
  - Grasses
  - Legumes
  - Shrubs
  - Trees, conifers
  - Trees, hardwoods
- o Diversion and Collection Systems
  - Dikes and berms
  - Ditches and trenches
  - Terraces and benches
  - Chutes and downpipes
  - Seepage basins
  - Sedimentation basins and ponds
  - Levees
  - Addition of freeboard
  - Floodwalls

C. Leachate and Groundwater Controls

- o Capping (see A.)
- o Containment barriers

  Function options

  - Downgradient placement
  - Upgradient placement
  - Circumferential placement

  Material and construction options (vertical barriers)

  - Soil-bentonite slurry wall
  - Cement-bentonite slurry wall
  - Vibrating beam
  - Grout curtains
  - Steel sheet piling

  Horizontal barriers (bottom sealing)

  - Block displacement
  - Grout injection

- o Groundwater pumping (generally used with capping and treatment)

  Function options

  - Extraction and injection
  - Extraction alone
  - Injection alone

  Equipment and Material Options

  - Well points
  - Deep wells
  - Suction wells
  - Ejector wells

- o Subsurface Collection Drains

  - French drains
  - Tile drains
  - Pipe drains (dual media drains)

D. Gas Migration Controls (generally used with treatment)

- o Capping (gas barriers) (see A.)
- o Gas Collection and/or Recovery
  - Passive pipe vents
  - Passive trench vents
  - Active gas collection systems

E. Excavation and Removal of Waste and Soil

- o Excavation and Removal
  - Backhoe
  - Cranes and attachments
  - Front end loaders
  - Scrapers
  - Pumps
  - Industrial vacuums
  - Drum grapplers
  - Forklifts and attachments
- o Grading (see B.)
- 0 Capping (see A.)
- o Revegetation (see B.)

F. Removal and Containment of Contaminated Sediments

- o Sediment removal

  Mechanical dredging
  - Clamshell
  - Dragline
  - Backhoe

  Hydraulic dredging
  - Plain suction
  - Cutterhead
  - Dustpan

Pneumatic dredging

- Airlift
- Pneuma
- Oozer

o Sediment turbidity controls and containment

- Curtain barriers
- Coffer dams
- Pneumatic barriers
- Capping

G. In-situ Treatment

o Hydrolysis
o Oxidation
o Reduction
o Soil aeration
o Solvent flushing
o Neutralization
o Polymerization
o Sulfide precipitation
o Bioreclamation
o Permeable treatment beds
o Chemical dechlorination

H. Direct Waste Treatment

o Incineration

- Rotary kiln
- Fluidized bed
- Multiple hearth
- Liquid injection
- Molten salt
- High temperature fluid wall
- Plasma arc pyrolysis
- Cement kiln
- Pyrolysis/starved combustion
- Wet air oxidation
- Industrial boiler or furnace

- o Gaseous waste treatment

  - Activated carbon
  - Flares
  - Afterburners

- o Treatment of aqueous and liquid waste streams

  Biological treatment

  - Activated sludge
  - Trickling filters
  - Aerated lagoons
  - Waste stabilization ponds
  - Rotating biological disks
  - Fluidized bed bioreactors

  Chemical treatment

  - Neutralization
  - Precipitation
  - Oxidation
  - Hydrolysis
  - Reduction
  - Chemical dechlorination
  - Ultraviolet/ozonation

  Physical treatment

  - Flow equalization
  - Flocculation
  - Sedimentation
  - Activated carbon
  - Kleensorb
  - Ion exchange
  - Reverse osmosis
  - Liquid-liquid extraction
  - Oil-water separator
  - Steam distillation
  - Air stripping
  - Steam stripping
  - Filtration
  - Dissolved air flotation

  Discharge to a publicly owned treatment works

- Removal and replacement
- Alternative drinking water supplies
  - Cisterns or tanks
  - Deeper or upgradient wells
  - Municipal water systems
  - Relocation of intake
- Individual treatment units